

NASA

National Aeronautics and
Space Administration

Budget Estimates

FISCAL YEAR **1979**

Volume III

Research and Program Management
Special Analyses

LIBRARY

National Aeronautics and Space Administration
Washington, D.C. 20546

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1979 ESTIMATES

RESEARCH AND PROGRAM A

TABLE OF CONTENTS

VOLUME III

	<u>Page No.</u>
<u>General Statement</u>	SUM 1
Summary of budget plan by function.....	SUM 1
Summary of permanent positions by installation.....	SUM 9
Summary of budget plan by installation.....	SUM 9
Distribution of permanent positions by program.....	SUM 10
<u>Summary Tables</u>	
Distribution of budget plan by function by installation.....	SUM 11
Appropriation language (proposed).....	SUM 12
Program and financing schedule.....	SUM 13
<u>Installation Justification</u>	
Johnson Space Center.....	RPM 1 1-32
Kennedy Space Center.....	RPM 2 1-31
Marshall Space Flight Center.....	RPM 3 1-39
National Space Technology Laboratories.....	RPM 4 1-16
Goddard Space Flight Center.....	RPM 5 1-31
Wallops Flight Center.....	RPM 6 1-25
Ames Research Center.....	RPM 7 1-28
Dryden Flight Research Center.....	RPM 8 1-22
Langley Research Center.....	RPM 9 1-27
Lewis Research Center.....	RPM 10 1-25
NASA Headquarters.....	RPM 11 1-20
<u>Special Analyses</u>	
Jet Propulsion Laboratory.....	SA 1
Summary of aeronautical research and technology.....	SA 11
Analysis of equipment estimates - FY 1979.....	SA 13

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

GENERAL STATEMENT

The Research and Program Management appropriation provides for: (1) the civil service staff comprising the direct civil service personnel needed to perform in-house research, technology, and test activities; and the personnel needed to plan, manage, and support the Research and Development programs; and (2) the other elements of operational capability of the laboratories and facilities. Over three-fourths of this appropriation is required to cover salaries and benefits of civil service employees. The balance is required for essential travel, facilities services, technical services, and management and operations support of all NASA installations.

Each center has been assigned certain principal roles of fundamental importance in meeting the agency's overall program goals. These principal roles reflect the intrinsic competence of the centers on the basis of demonstrated capabilities. The FY 1979 budget provides the resources necessary to maintain the capabilities and apply them to the appropriate program activities.

Summary of Budget Plan by Function

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
Personnel and Related Costs.....	645,158	649,104	646,104	695,093
Supplemental Requested for Civilian Pay Increase.....	---	---	46,200	---
Travel.....	16,683	17,846	17,566	18,741
Facilities Services.....	90,112	89,758,	91,244	102,841
Technical Services.....	40,036	36,915	36,160	40,357
Management and Operations Support... ..	<u>52,372</u>	<u>53,366</u>	<u>52,926</u>	<u>56,968</u>
Total.....	<u>844,361</u>	<u>846,989</u>	<u>890,200</u>	<u>914,000</u>

1. Personnel and Related Costs includes salaries and benefits for civil service personnel, and for personnel of other Government agencies detailed to NASA. This category also includes supporting personnel costs, such as moving expenses (excluding travel of personnel), recruiting and personnel investigation services provided by the Civil Service Commission, and personnel training.

2. Travel includes the cost of transportation, per diem, and other associated expenses required for direction, coordination, and management of research and development and construction of facilities program activities; for contract management and flight mission support; for overseas travel to launch and tracking sites; for travel to meetings and technical seminars; and for all local and relocation travel expenses.

3. Facilities Services includes rental of real property, the cost of maintenance and related services, engineering, custodial services, minor modifications, and utilities.

4. Technical Services includes the cost of general purpose automatic data processing, the dissemination of scientific and technical information derived from the various research and development programs, educational/informational program activities, and shop support and services.

5. Management and Operations Support includes the cost of communications, printing and reproduction, administrative supplies, general purpose materials and equipment, transportation (excluding movement of personnel), medical services, and other support activities.

SUMMARY OF CHANGES FROM 1978 BUDGET ESTIMATE
TO 1978 CURRENT ESTIMATE
(Thousands of Dollars)

	1978 <u>Current Estimate</u>
Budget request	846,989
Congressional action.....	<u>-2,989</u>
Appropriation.....	<u>844,000</u>
Plan not including unbudgeted pay increases.....	844,000
Unbudgeted pay increases.....	49,480
Portion of unbudgeted pay increases absorbed.....	<u>-3,280</u>
Plan based on current salary rates.....	<u>890,200</u>
Supplemental appropriation requested to cover FY 1978 deficiency	<u>46,200</u>

There are four major changes that have occurred from the 1978 Budget to the 1978 Current Estimate:

1. A reduction of 500 in permanent civil service positions directed by the President in June 1977.
2. Congressional action on the 1978 budget resulted in a reduction of \$2,989,000 from the NASA request.
3. The cost of pay increases, including the October 1977 Governmentwide, various wage board, and the February 1977 Executive pay increases, for which no provision was made in the 1978 budget request. After absorbing \$3,280,000 of the pay increases within the \$844 million appropriation, a supplemental appropriation of \$46,200,000 has been requested as a part of the President's governmentwide supplemental request.
4. The net effect of many management actions required to achieve the economies necessary to offset rate and price increases for utilities, contractor support, and for purchased goods and equipment. The largest increase is in utility rates above that budgeted, and the major reduction is a 238 workyear decrease in the level of effort for contractor support.

The current estimate for 1978, including the proposed supplemental appropriation, is \$890,200,000.

SUMMARY OF CHANGES - 1978 CURRENT ESTIMATE TO 1979 ESTIMATE

The budget request for 1979 is \$914,000,000, an increase of \$23,800,000 over the current estimate for 1978. The 1979 estimate provides for the full year effect of increases in utility rates, contractor wage rates, and the cost of materials, which continue to rise more rapidly than conservation efforts can offset. Personnel compensation estimates include the net cost of the full year effect of the increased pay costs, partially offset by the full year effect of the 1978 reduction in civil service positions.

The Research and Program Management appropriation request is categorized into five functional areas as follows:

1. Personnel and Related Costs. The 1979 estimates provide for the full year cost of the 1978 pay raises as well as the costs for within-grade advances and career development. These costs are partially offset by the full year savings from the reduction of civil service positions in 1978. The net increase in personnel and related costs is \$2,789,000.
2. Travel. The 1979 estimate for travel is based on the need to augment the 1978 level of program travel to meet 1979 program milestones. The major milestones are: Shuttle Orbiter Flight Test; Spacelab fabrication, testing, and first flight; improved helicopter performance; and flight and operations support for High Energy Astronomy Observatory-C, Voyager, and Atmospheric Explorers. There are increases in scientific and technical meeting travel and in management operations travel to reflect minor changes in requirements, and the full year effect of 1978 cost increases. The overall increase in travel is \$1,175,000.

3. Facilities Services. The 1979 estimates provide for the full year effect of contractor wage increases, utility rate increases and the higher supply and material costs. This results in an overall increase of \$11,597,000

4. Technical Services. The 1979 estimates provide for the full year effect of contractor wage increases, partially offset by a reduction in service contractor support, resulting in a net increase of \$4,197,000

5. Management and Operations Support. The increases shown for 1979 reflect the full year costs of communications and support contractor wage increases and a reduction in contractor effort, which results in a net increase of \$4,042,000.

The content of each function is explained in more detail in the following pages. The detailed requirements for each installation are covered in their respective sections of this presentation.

PERSONNEL AND RELATED COSTS

A. COMPENSATION AND BENEFITS :

1. Compensation:

a. Permanent Positions: This category of personnel costs covers the salaries of permanent civil service employees, and is the largest part of personnel and related costs. The funds shown will support the civil service complement of 23,237 at the end of 1979. The estimate for permanent compensation is based upon the position structure at the start of the year, as modified by the abolishment of positions, within grade advances, career development, and other changes occurring during the year.

b. Nonpermanent: The nonpermanent category covers the salaries of nonpermanent employees participating in the Cooperative Training, Summer, Youth Opportunity and Temporary Clerical programs.

c. Reimbursable Detailees: In accordance with existing agreements, NASA reimburses the parent Federal organization for the salaries and related costs of the persons detailed to NASA.

d. Overtime and Other Compensation: Overtime, holiday pay, post and night differential, and hazardous duty pay are included in this category.

2. Benefits:

In addition to compensation, NASA makes an employer's contribution to personnel benefits as authorized and required by law. These benefits include contributions to the Civil Service Retirement Fund, employees life and health insurance, and social security contributions for nonpermanent employees. The incentive awards provide cash awards for outstanding achievement by NASA employees, superior performance awards, and for improvements of a center's operations. Payments for severance pay are made to former employees involuntarily separated through no fault of their own.

B. SUPPORTING COSTS:

1. Transfer of Personnel:

Relocation costs, such as the expenses of selling and buying a home, and the movement and storage of household goods are provided under this category.

2. Civil Service Commission Services:

The Civil Service Commission is reimbursed for security investigations on new hires, for recruitment advertising, career-maturity surveys, and any requested investigation of formal discrimination complaints.

3. Personnel Training:

Training is provided within the framework of the Government Employees Training Act of 1958. Part of training consists of courses offered by other Government agencies, usually for a fee, and the remainder is provided through nongovernment sources.

TRAVEL

A. Program Travel:

The largest individual part of travel is for direction, coordination and management of program activities. The complexity of the programs involved and the geographical distribution of NASA centers and contractors and subcontractors effort throughout the entire United States impose the requirement for this category of travel. As projects reach the flight stage, support is required for prelaunch and postlaunch activities, including overseas travel to launch and tracking sites. The amount of travel required for this purpose is directly related to both the number and complexity of the launches.

B. Scientific and Technical Meeting Travel:

Travel to scientific and technical meetings and seminars permits employees engaged in research and development to participate at both government-sponsored and nongovernment-sponsored meetings and seminars. This participation allows personnel to benefit from exposure to technological advances in the field which arise outside NASA, as well as allowing personnel to present both accomplishments and problems to their associates. Many of the government-sponsored meetings are working panels convened to solve certain problems for the benefit of the government.

C. Management and Operations Travel:

Management and Operations Travel includes travel for the direction and coordination of general management matters and travel by officials to review the status of programs. It includes travel by functional managers in such areas as personnel, financial management, and procurement. This category also includes the cost of travel in and around the centers, including bus and taxi services and rental of motor vehicles; travel of unpaid members of research advisory committees; and initial duty station, permanent change of assignment, and other family travel expenses.

FACILITIES SERVICES

A. Rental of Real Property:

Rental of real property includes the rental of building space directly by NASA or through the General Services Administration to meet offsite office, warehousing, and other requirements which cannot otherwise be provided for in existing buildings at the NASA Centers. Included in this item is the rental of trailers required to accommodate special short-term needs.

B. Maintenance and Related Activities:

Maintenance and related activities includes the recurring day-to-day maintenance of facilities (grounds, buildings, structures, etc.) and of other equipment which is accomplished by non-Civil Service personnel. This involves the mowing and care of grassy areas, care of trees and shrubs, elevators, crane, and pressure vessel inspections, painting and protective coatings, general buildings maintenance, and the maintenance of installed mechanical, electrical, and other systems. In addition, this item includes feasibility studies, project design, construction supervision, inspection, and other institutional engineering functions. Included also, are any applicable costs associated with recurring facility work as well as materials, hardware, and equipment used in facility maintenance activities whether accomplished by Civil Service personnel or contractors. In the case of equipment, related maintenance and other services are reflected for office, shop, laboratory, and other facilities equipment as well as administrative intercommunications and television monitoring equipment.

C. Custodial Services:

Custodial services include janitorial and building cleaning services; pest control; fire protection service security services including badging and identification; lock and safe repair; trash and refuse handling; window blinds and light fixture cleaning; light fixture replacement; and laundry and dry cleaning of facility related items.

D. Utilities Services:

Utilities services include the purchase of utilities including electricity, natural gas, fuel oil, coal, steam, propane, and other fuel commodities as well as water and sewage treatment services. Also included are the related operating costs of the utility plants and systems and the cost of plant maintenance.

TECHNICAL SERVICES

A. Automatic Data Processing:

1. Equipment:

This category provides for the lease, purchase, and maintenance of general purpose data processing equipment which supports institutional operations at each installation. Excluded is equipment dedicated to specific research or to operational systems which is funded from the Research and Development appropriation.

2. Operations:

Operations services include programming, computer operations and related services. Institutional-type applications include payroll, personnel data, logistics, and procurement records and reports.

B. Scientific and Technical Information and Educational Programs:

1. Libraries:

The technical libraries are established to provide center staffs with books, periodicals, technical reports, and other documentation.

2. Educational/Information Programs:

The educational and informational programs provide for the documentation and dissemination of information **about** the agency's programs to the general public, the educational community at the elementary and secondary levels, and the mass communications media. Assistance to the mass communications media includes the assembly and exposition of newsworthy material in support of requests, and takes such form as press kits, news releases, television and radio information tapes and clips, and feature material.

C. Shop Support and Services:

Shop support and services include general fabrication shops, reliability and quality assurance activities, safety, photographic services, graphics+and audio visual material.

MANAGEMENT AND OPERATIONS

A. Administrative Communications:

Included in this category are costs of leased lines; long distance tolls; teletype services; local telephone service; and postage.

B. Printing and Reproduction:

Included in this category are the costs for duplicating, blueprinting; microfilming, and other photographic reproductions. Also included in this category are Government Printing Office, contractual printing and the related composition and binding operations.

C. Transportation:

Transportation services include the operation and maintenance of all general purpose motor vehicles used by both civil service and support contractor personnel. The cost of movement of supplies and equipment by commercial carrier are also in this category.

D. Installation Common Services:

Installation common services include support activities at each installation such as: occupational medicine and environmental health; mail service; supply management; patent services; administrative equipment; office supplies and materials; operation of photocopy equipment; and chart and related art work.

DISTRIBUTION OF PERMANENT POSITIONS BY INSTALLATION

<u>Installation</u>	<u>1977 Actual</u>	<u>1978</u>		<u>1979 Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
Johnson Space Center.....	3,585	3,613	3,526	3,546
Kennedy Space Center.....	2,230	2,259	2,186	2,207
Marshall Space Flight Center.....	3,910	3,910	3,760	3,715
National Space Technology Laboratories.....	70	70	100	104
Goddard Space Flight Center.....	3,625	3,625	3,548	3,548
Wallops Flight Center.....	410	413	408	408
Ames Research Center.....	1,613	1,601	1,677	1,677
Dryden Flight Research Center.....	515	520	490	490
Langley Research Center.....	3,135	3,165	3,069	3,069
Lewis Research Center.....	2,998	3,025	2,938	2,938
Headquarters.....	1,545	1,536	1,535	1,535
Total, Permanent Positions.....	<u>23,636</u>	<u>23,737</u>	<u>23,237</u>	<u>23,237</u>

SUMMARY OF BUDGET PLAN BY INSTALLATION (Thousands of Dollars)

Johnson Space Center.....	139,488	139,581	145,875	150,296
Kennedy Space Center.....	109,742	110,141	112,549	118,431
Marshall Space Flight Center.....	139,417	134,693	141,485	140,857
National Space Technology Laboratories.....	1,840	1,942	2,764	3,488
Goddard Space Flight Center.....	114,874	116,133	122,247	124,139
Wallops Flight Center.....	13,268	14,226	14,539	15,205
Ames Research Center.....	53,265	53,706	58,373	59,212
Dryden Flight Research Center.....	17,333	17,034	18,727	19,481
Langley Research Center.....	95,597	95,411	102,589	104,579
Lewis Research Center.....	83,818	88,706	90,761	93,780
Headquarters.....	75,719	75,416	80,291	84,532
Total.....	<u>844,361</u>	<u>846,989</u>	<u>8</u>	<u>914,000</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1979 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF PERMANENT POSITIONS BY PROGRAM

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u>	1978 <u>Current Estimate</u>	1979 <u>Budget Estimate</u>
<u>Program Office and Program</u>				
<u>SPACE TRANSPORTATION SYSTEM</u>	<u>7.255</u>	<u>7.239</u>	<u>6.939</u>	<u>6.883</u>
Space shuttle	5.129	5.053	4.854	4.412
Space flight operations	1.630	1.597	1.647	2.082
Expendable launch vehicles	496	589	438	389
<u>SPACE SCIENCE</u>	<u>2.387</u>	<u>2.221</u>	<u>2.305</u>	<u>2.313</u>
Physics and astronomy	1.799	1.615	1.769	1.788
Lunar and planetary exploration	330	348	282	267
Life sciences	258	258	254	258
<u>SPACE AND TERRESTRIAL APPLICATIONS</u>	<u>1.857</u>	<u>1.902</u>	<u>1.879</u>	<u>1.977</u>
Space applications	1.782	1.825	1.805	1.902
Technology utilization	75	77	74	75
<u>AERONAUTICS AND SPACE TECHNOLOGY</u>	<u>5.665</u>	<u>5.830</u>	<u>5.759</u>	<u>5.735</u>
Aeronautical research and technology	3.708	3.795	3.933	3.925
Space research and technology	1.437	1.485	1.267	1.286
Energy technology application	520	550	559	524
<u>TRACKING AND DATA ACQUISITION</u>	<u>831</u>	<u>845</u>	<u>784</u>	<u>782</u>
Subtotal. Direct Positions	<u>17.995</u>	<u>18.037</u>	<u>17.666</u>	<u>17.690</u>
<u>CENTER MANAGEMENT AND OPERATIONS SUPPORT POSITIONS</u>	<u>5.641</u>	<u>5.700</u>	<u>5.571</u>	<u>5.547</u>
<u>TOTAL. PERMANENT POSITIONS</u>	<u>23.636</u>	<u>23.737</u>	<u>23.237</u>	<u>23.237</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FISCAL YEAR 1979 ESTIMATES
RESEARCH AND PROGRAM MANAGEMENT
DISTRIBUTION OF BUDGET PLAN BY FUNCTION BY INSTALLATION
(Thousands of Dollars)

FUNCTION	Total NASA	Johnson Space Center	Kennedy Space Center	Marshall Space Flight Center	National Space Technology Laboratories	Goddard Space Flight Center	Wallops Flight Center	Ames Research Center	Dryden Flight Research Center	Langley Research Center	Lewis Research Center	Headquarters
<u>Personnel and Related Costs</u>												
1977 Actual	645.158	104.879	60.962	110.751	1.792	97.121	9.406	44.825	13.449	80.314	71.943	49.716
1978 Budget	649.104	106.021	61.817	108.187	1.910	97.696	9.913	44.197	13.477	79.986	76.745	49.155
1978 Current	692.304	112.382	65.608	115.758	2.714	103.861	10.197	48.506	14.122	85.456	79.854	53.846
1979 Estimate	695.093	113.183	66.705	114.413	2.823	104.343	10.313	49.377	13.798	85.568	80.253	54.317
<u>Travel</u>												
1977 Actual	16.683	3.141	2.230	2.141	48	2.253	290	1.003	320	1.887	1.007	2.363
1978 Budget	17.846	3.541	2.418	2.291	32	2.251	283	1.071	399	2.066	1.105	2.389
1978 Current	17.566	3.410	2.412	2.216	50	2.296	241	1.121	389	1.999	1.066	2.366
1979 Estimate	18.741	3.626	2.338	2.382	65	2.476	348	1.230	388	2.156	1.187	2.545
<u>Facilities Services</u>												
1977 Actual	90.112	16.495	25.321	11.436	---	8.660	2.365	4.131	1.999	7.508	8.051	4.146
1978 Budget	89.758	14.657	25.056	11.016	---	8.667	2.694	5.573	2.145	6.374	8.328	5.248
1978 Current	91.244	15.771	23.967	10.418	---	8.979	2.762	5.565	2.845	8.237	7.595	5.035
1979 Estimate	102.841	17.560	27.906	10.598	350	9.895	2.959	5.309	3.628	9.321	9.705	5.610
<u>Technical Services</u>												
1977 Actual	40.036	6.630	6.015	7.707	---	2.457	260	849	310	1.514	955	13.339
1978 Budget	36.915	6.653	5.564	6.728	---	2.182	229	565	103	1.572	699	12.620
1978 Current	36.160	5.779	6.195	6.072	---	1.999	237	642	313	1.721	466	12.736
1979 Estimate	40.357	6.785	6.182	6.418	50	2.046	449	607	348	1.825	565	15.082
<u>Management and Operations</u>												
1977 Actual	52.372	8.343	15.214	7.382	---	4.383	947	2.457	1.255	4.374	1.862	6.155
1978 Budget	53.366	8.709	15.286	6.471	---	5.337	1.107	2.300	910	5.413	1.829	6.004
1978 Current	52.926	8.533	14.367	6.951	---	5.112	1.102	2.539	1.058	5.176	1.780	6.308
1979 Estimate	56.968	9.142	15.300	7.046	200	5.379	1,136	2.689	1.319	5.709	2.070	6.978
TOTAL												
1977 Actual	844.361	139.488	109.742	139.417	1.840	114.874	13.268	53.265	17.333	95.597	83.818	75.719
1978 Budget	846.989	139.581	110.141	134.693	1.942	116.133	14.226	53.706	17.034	95.411	88.706	75.416
1978 Current	890.200	145.875	112.549	141.485	2.764	122.247	14.539	58.373	18.727	102.589	90.761	80.291
1979 Estimate	914.000	150.296	118.431	140.857	3.488	124.139	15.205	59.212	19.481	104.579	93.780	84.532

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

RESEARCH AND PROGRAM MANAGEMENT

For necessary expenses of research in Government laboratories, management of programs and other activities of the National Aeronautics and Space Administration, not otherwise provided for, including uniforms or allowance therefor, as authorized by law (5 U.S.C. 5901-5902); awards; hire, maintenance and operation of administrative aircraft; purchase (not to exceed [twenty-seven] *twenty-nine* for replacement only) and hire of passenger motor vehicles; and maintenance and repair of real and personal property, and not in excess of \$25,000 per project for construction of new facilities and additions to existing facilities, and not in excess of \$30,000 per project for rehabilitation and modification of facilities; **[\$844,000,000] \$914,000,000: Provided**, That contracts may be entered into under this appropriation for maintenance and operation of facilities, and for other services, to be provided during the next fiscal year: *Provided further*, That not to exceed \$25,000 of the foregoing amount shall be available for scientific consultation or extraordinary expense, to be expended upon the approval or authority of the Administrator and his determination shall be final and conclusive. (42 U.S.C. 2451, at. seq.; Department of Housing and Urban Development—Independent Agencies Appropriation Act, 1978; additional authorizing legislation to be proposed.)

RESEARCH AND PROGRAM MANAGEMENT—Continued

Program and Financing (in thousands of dollars)

Identification code 80-0103-0-1-999	Budget plan			Costs and obligations		
	1977 actual	1978 at.	1979 at.	1977 actual	1978 at.	1979 est.
Program by activities:						
Direct program:						
1. Space transportation systems	370,459	381,620	388,400	370,062	381,620	388,400
2. Scientific investigations in space	107,866	113,460	115,700	107,752	113,460	115,700
3. Space and terrestrial applications	88,368	96,160	101,300	88,272	96,160	101,300
4. Space research and technology	63,427	18,780	60,800	63,358	58,780	60,800
5. Aeronautical research and technology	152,507	174,730	181,200	152,342	174,730	181,200
6. Energy technology applications	20,736	23,920	24,000	20,713	23,920	24,000
7. Supporting activity	40,998	41,530	42,600	40,998	41,530	42,600
Total direct program costs, funded	844, MI	890,200	914,000	843,455	890,200	914,000
Reimbursable program:						
1. Space transportation systems	1,057	1,086	1,865	1,047	1,086	1,865
2. Scientific investigations in space	303	174	180	301	174	180
3. Space and terrestrial applications	6,123	9,325	7,153	6,066	9,325	7,153
4. Space research and technology	87	43	43	86	43	43
5. Aeronautical research and technology	241	188	86	239	188	86
6. Energy technology applications	9,162	9,893	11,691	9,072	9,893	11,691
7. Supporting activity	11,911	12,191	11,582	11,797	12,191	11,582
Total reimbursable program costs	28,884	32,900	32,600	28,613	32,900	32,600
Total program costs, funded	873,245	923,100	946,600	872,068	923,100	946,600
Change in selected resources (undelivered orders)				1,177		
10.00 Total	073,245	923,100	946,600	873,245	923,100	946,600
Financing:						
Offsetting collections from:						
11.00 Federal funds				-20,379	-24,093	-25,955
14.00 Non-Federal sources				-8,505	-8,007	-6,645
25.40 Unobligated balance lapsing				214		
Budget authority				844,575	890,200	914,000
Budget authority:						
40.00 Appropriation				844,575	844,000	914,000
44.20 Supplemental now requested for civilian pay raises					46,200	
Relation of obligations to outlays:						
71.00 Obligations incurred, net				844,361	890,200	914,000
72.40 Obligated balance, start of year				74,442	57,163	58,863
74.40 Obligated balance, end of year				-57,163	-58,863	-60,563
77.40 Adjustments in expired accounts				-1,962		
90.00 Outlays, excluding pay raise supplemental				859,678	844,000	910,600
91.20 Outlays from civilian pay raise supplemental					44,500	1,700

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

LYNDON B. JOHNSON SPACE CENTER

DESCRIPTION

The Lyndon B. Johnson Space Center is located approximately 20 miles southeast of downtown Houston, Texas. Total NASA-owned land at the Houston site consists of 1,620 acres. The Center also utilizes an additional 54,080 acres at the White Sands Test Facility, Las Cruces, New Mexico. The total capital investment of the Lyndon B. Johnson Space Center, including fixed assets in progress and contractor-held facilities at various locations and the White Sands Test Facility, as of September 30, 1977, was \$744,259,000.

CENTER ROLES AND MISSIONS

The Johnson Space Center (JSC) was established in November 1961, in response to the need for NASA to designate a primary Center to manage the design, development and manufacture of manned spacecraft; for selection and training of astronaut crews; and the conduct of manned space flight missions. It was necessary to focus this responsibility in a Federal laboratory since the Government was to be the customer, consumer and facility owner of an activity which was viewed as possessing considerable risk and much uncertainty because of the total lack of previous experience. This need continued as the Nation proceeded towards more ambitious undertakings such as the Apollo program, the Skylab program, the Apollo Soyuz Test Project and the current Space Shuttle program. In order to meet this responsibility, JSC has developed unique areas of recognized technical excellence within the civil service staff and facilities of superior merit; that is, major technical facilities which constitute a national resource. The principal and supporting roles are:

PRINCIPAL

Manned Vehicles - development of manned space vehicles and associated supporting technology, including:

Space Shuttle - development of the orbiter and lead Center for management of the Shuttle system. Providing sustaining engineering and logistical support for Space Transportation System (STS) hardware. Includes Shuttle configuration management, Shuttle sustaining engineering and orbiter operational procurement.

Advanced Missions - focus is on orbital systems and advanced transportation systems.

Environmental and Crew Support Systems - develop and demonstrate Environmental Control and Life Support Subsystems (EC/LSS) and Extra Vehicular Activity (EVA) systems suitable for the space transportation systems and other advanced needs.

Food Systems Technology - developing nutritional requirements and food processing systems in support of human space flight.

Environmental Effects Analysis - manage efforts to develop the data base and conduct analyses to ascertain any environmental impact of STS operations.

Supporting Technology Advanced Developments - development of prototypes, long lead time systems and new procedures and software for advanced systems.

Operations - operational planning, crew selection and training, medical operations, space transportation system flight control, experiment/payload flight control for attached payloads and STS utilization planning/payload accommodation studies.

Life Sciences:

Medical Research - establishing human baseline data, investigating and developing countermeasures to solve space medicine problems, and developing information techniques and equipment to support medical operations and medical experiments.

Spacelab Payloads - development of Spacelab life sciences research capability through common operating research equipment development. Defining, developing and integrating inflight biomedical experiments. Providing for the integration of dedicated life sciences Spacelab experiments and integration for human studies experiments.

Lunar and Planetary Geosciences - developing and maintaining the technical discipline base for lunar and planetary geosciences and extraterrestrial sample handling techniques.

Earth Resources Surveys - provide a discipline base for earth resources applications, including airborne techniques and space-based flight sensors.

Applications Systems Verification Tests - conducting interagency operational tests to demonstrate automated natural resources inventory systems. Current emphasis includes the Large Area Crop Inventory Experiment.

SUPPORTING

Technology Experiments in Space - management of orbiter experiments program. Definition and development of experiments in areas consistent with other JSC space roles.

Energy Systems - conducting Satellite Power Systems definition activities.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	<u>1977</u> <u>Actual</u>	<u>1978</u> Budget <u>Estimate</u> (Thousands of Dollars)	Current <u>Estimate</u>	1979 Budget <u>Estimate</u>
I. Personnel and Related Costs	104,879	106,021	112,382	113,183
II. Travel	3,141	3,541	3,410	3,626
III. Facilities Services	16,495	14,657	15,771	17,560
IV. Technical Services	6,630	6,653	5,779	6,785
V. Management and Operations	<u>8,343</u>	<u>8,709</u>	<u>8,533</u>	<u>9,142</u>
Total, fund requirements	<u>139,488</u>	<u>139,581</u>	<u>145,875</u>	<u>150,296</u>

Distribution of Permanent Positions by Program

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u>	1978 <u>Current Estimate</u>	1979 <u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>2,575</u>	<u>2,616</u>	<u>2,604</u>	<u>2,628</u>
Space shuttle.....	2,287	2,382	2,275	2,032
Space flight operations.....	288	234	329	596
<u>Space Sciences</u>	<u>162</u>	<u>152</u>	<u>136</u>	<u>136</u>
Physics and astronomy.....	53	11	---	---
Lunar and planetary exploration.....	24	51	52	52
Life sciences.....	85	90	84	84
<u>Space and Terrestrial Applications</u>	<u>269</u>	<u>258</u>	<u>203</u>	<u>199</u>
Space applications.....	265	254	199	195
Technology utilization....	4	4	4	4
<u>Aeronautics and Space Technology</u>	<u>42</u>	<u>54</u>	<u>45</u>	<u>45</u>
Space research and technology,.....	10	13	10	10
Energy technology applications.....	<u>32</u>	<u>41</u>	<u>35</u>	<u>35</u>
Subtotal, direct positions.....	3,048	3,080	2,988	3,008
<u>Center Management and Operations Support positions</u>	<u>537</u>	<u>533</u>	<u>538</u>	<u>538</u>
Total, permanent positions.....	<u>3,585</u>	<u>3,613</u>	<u>3,526</u>	<u>3,546</u>

PROGRAM DESCRIPTION

SPACE SHUTTLE

2,032 Permanent Positions (Civil Service)

The FY 1979 staffing provides for continuation of design, development, test and evaluation activity on a schedule consistent with the major program milestones including the first manned orbital flight. Activities will continue consistent with completion of a phased delivery of the total orbiter fleet. Procurement of necessary initial flight and ground support equipment will be initiated.

The Space Shuttle Program Office of the Lyndon B. Johnson Space Center (JSC) has program management responsibility for program control, overall systems engineering, and Space Shuttle System integration. The Space Shuttle Program Office (SSPO) provides management of the "Lead Center" functions as related to the Space Shuttle program and the overall systems management and integration of all elements of the program. The Space Shuttle Orbiter Project Office provides overall management of the design, development, test and production of the Orbiter system. This includes management of various elements of the total Orbiter system (e.g., structures, propulsion, power, avionics, etc.) and to lower elements within the subsystems.

In order to adequately integrate all vehicle systems into an efficient operating system, many detailed interfaces and functional performance features must be identified and defined. Specific interface control documents are identified and established including both flight systems and flight to ground systems. General compatibility and performance criteria are established for special areas of consideration such as electromagnetic compatibility and lightning protection. For proper systems operations, systems performance data and operational information are prepared such as operational data books, mission requirement documents, etc.

Although major Shuttle flight system elements have been individually managed through designated Shuttle element project offices and related provisioning contractors, a relatively large quantity of supporting equipment is supplied to the program through other elements of JSC. Examples of such equipment are: extravehicular mobility unit, portable oxygen system, closed circuit television, survival radio sets, dosimetry, crew equipment, photographic camera systems, and bioinstrumentation. Each represents a multitude of engineering, management, and evaluation activities. These include definition of requirements, establishment of contract, management of contractor projects, evaluation of design and performance, and provisioning of equipment in a certified "ready for use" configuration. Mission use of equipment also requires onsite processing for preparation and related reconditioning for sequential missions.

Throughout the orbiter program, particular attention is required to prediction of vehicle performance in each area of function, to analysis of design, establishment and conduct of necessary tests and rectification of actual vs. predicted performance differences. Since the orbiter represents an integrated complex of technical and engineering disciplines, specific test, evaluation and analysis subtasks have been assigned to the variety of technical organizations at JSC. Included in these tasks are: providing technical expertise in the Orbiter life support systems; performing engineering analysis design definition, performance evaluation, and breadboard testing for communications and tracking systems ground testing; providing expertise in guidance, navigation, control, instrumentation and electrical power distribution; management and operation of environmental test chambers; analysis, evaluation and component testing of the Orbiter hydraulics system, auxiliary power unit, orbital maneuvering system components, reaction control engine performance, reaction control system engine valve leak detection techniques and development of initiator firing units; analysis and laboratory testing for vehicle attachment and separation systems; design analysis of total Shuttle systems, Shuttle/payload interface design, crew station evaluation and design, Shuttle airlock design evaluation, etc.; conduction of engineering analysis to determine overall vehicle performance characteristics in the area of aerodynamic performance, flight characteristics, performance, and dynamics including aeroelasticity.

The successful flight and operational performance of the Space Shuttle is dependent on the proper functioning of integrated electronic equipments. Collectively, these are termed the Integrated Avionics System. Avionics provide the Shuttle pilots and crew with the total assessment and command capability necessary to manage, fly and operate the vehicle. Because of the criticality of this system, very close attention is required to the identification of performance requirements, systems design, and integrated performance.

A variety of avionic elements are included within the Space Shuttle System, each of which requires attention of this group of technical experts. These elements include: guidance, navigation and control, data processing, communication and tracking; instrumentation, displays and controls, solid rocket booster control and recovery interface, power and control, and external tank propellant control and instrumentation.

Avionics and software testing and checkout in the Electronics Systems Test Laboratory and the Shuttle Avionics Integration Laboratory have effectively supported the Approach and Landing Test (ALT) effort, and configuration changeover for Orbital Flight Testing (OFT) is scheduled to start in 1979. Their purpose is to verify the functional performance of Shuttle Integrated Avionics System and validate the system design and verify compatibility of the various radio frequency communication links.

For OFT training, the Orbiter Aeroflight Simulator (OAS) will be updated to the OV-102 configuration and become one of the elements of the Shuttle Mission Simulator (SMS) complex. This complex will be the main training facility but will be supplemented by a number of part task trainers and specialized training devices. The development schedule for the SMS calls for initial training operations to begin in 1978 and full integrated simulations (SMS tied into MCC) to begin in early 1979. This schedule will provide adequate support for the first manned orbital flight. The training schedule requires 20 training hours per week per crew station. Involved in

simulator operations are the performance of simulator readiness, runs prior to the start of a scheduled program, assuring that all aspects of the simulator required for the day's operation are functioning correctly; the operation of the simulators during the exercises; and the documentation of any abnormal operation identified in the simulator performance or configuration.

The MCC update involves the management of the design, development, integration, and testing of all Mission Control Center (MCC) software required to support the Shuttle Orbital Flight Test (OFT) program. This includes modifications to old programs, new or replacement programs, their integration in the MCC, the integration of the MCC software and hardware, and software of the MCC for simulation, training, and actual flight operations. This is a major design change to the MCC software and requires new programs for the telemetry, command, tracking, and communications programs.

Orbital Flight Support includes a wide variety of planning activities ranging from operational concepts and techniques to detailed systems operational procedures and checklists. Tasks include flight system and software handbooks, flight rules, detailed crew activity plans and procedures; development of mission control center and network systems requirements; and, operations input to the initial planning for the selection and operation of Shuttle OFT payloads.

Specific OFT flight planning and software products include preliminary operational flight profiles and operational flight profiles at launch minus 13 and 4 months respectively for each flight. A payloads opportunities list keyed to each profile is provided in approximately the same timeframe. The flight planning activity encompasses the flight design, flight analysis, and utilization planning tasks for the OFT program. The flight design and flight analysis tasks include developing profiles on a preflight basis and supporting the development of flight techniques for OFT.

Software development is concerned with the development, formulation, coordination, and implementation of the requirements for all orbiter onboard computer software in the guidance, targeting, navigation, and systems management.

SPACE FLIGHT OPERATIONS

596 Permanent Positions (Civil Service)

JSC's support of the European Space Agency's Spacelab development effort includes developing a crew transfer tunnel and procurement of necessary mockups, trainers and ground support equipment not provided by ESA. Other activities include procurement of flight and ground hardware, and system activation activities which assure Spacelab compatibility with the orbiter and which will lead to an operational capability.

Upgrading the capability of the Mission Control Center requires additional hardware, equipment, and software to configure the MCC with the flight capability to support two orbiters simultaneously, a ground simulation network, and a MCC launch site interface. Work will also be done to focus on determining the most efficient method of operating

the STS, provide for integrating payloads on the OFT flights, provide facilities for command and control of Shuttle/Spacelab attached payloads (Skylab Reboost/Deboost which involves the development of the teleoperator retrieval system).

The advanced programs objective is to provide technical as well as programmatic data for the definition and evaluation of potential future space programs and systems. In support of these activities, advanced development and advanced studies are conducted to obtain significant performance and reliability improvements and to reduce future program risks and development costs through the effective use of new technologies. In fiscal year 1979 the advanced studies effort will concentrate on potential future early space stations and orbital transfer vehicles. Advanced operational concepts related to integrated launch operations, orbital assembly of large structures and orbital capability will be investigated in further detail. The advanced development effort will support the advanced study concepts in all the major technical disciplines. Orbital operations studies will be supported with design and testing of concepts applicable to assembly, maintenance and operation of large structures and complex satellite systems, rendezvous and inspection, and satellite retrieval and repair. Consumables management and advanced instrumentation studies will also be continued, and the funding will provide for testing and evaluation of major regenerative life support subsystems.

LUNAR AND PLANETARY EXPLORATION

52 Permanent Positions (Civil Service)

The Center provides scientific leadership in the Agency's Lunar and Planetary Exploration Geoscience program.

A strong, ongoing research group is required to carry out future programs in planetary geoscience; to provide skilled support to the lunar sample and geophysical data curatorial efforts; to provide knowledgeable personnel to interact with outside scientists; to contribute to the knowledge of the compositions, structures, and evolutionary histories of the inner planets, satellites, comets, and asteroids; and to assist in the dissemination of such information for purposes of scientific progress, education, and public interest.

The Center fulfills this role through an active, continuing program of scientific analysis of lunar, meteoritic, and terrestrial materials; experimentation pertinent to understanding how such materials acquired their observed characteristics; development of experiments for remote sensing of planetary geoscientific characteristics; analysis of data returned by remote sensors; and theoretical studies on planetary evolution. The scientific staff backs an experienced staff of operational personnel who maintain the lunar sample collection, manage the international program of scientific research, and assure that the Apollo lunar data is maintained satisfactorily for future research.

In addition, this scientific group is expected to guide the geoscientific study of the inner planets, satellites, asteroids, and comets. The Space Science Board of the National Research Council has recommended 15 classes of planetary exploration missions which include remote sensing from flybys and orbiters, remote sensing at and beneath the surfaces by penetrators and other landers, and sample returns. The objectives of these

missions are to provide information on the origins, structures, compositions, and evolutionary histories of the planets, etc. It is known that new instruments will have to be designed to provide most of the kinds of data that will be required. JSC geoscientists will have a major role in determining for the Agency the scientific requirements for these missions and in helping to implement them. This will require extensive cooperation with the community of planetary scientists.

LIFE SCIENCES

84 Permanent Positions (Civil Service)

The Johnson Space Center has the lead role in evaluating human physiological changes associated with the space environment and providing effective countermeasures to assure crew health and optimal performance. The scientific activities are to define, develop and integrate biomedical experiments for life sciences payloads. Additionally, these experiments are designed to utilize the space environment to accomplish medical and biological research for the benefit of man on Earth.

The medical activities provide for medical contingencies in flight involving onboard health services, training for crewmen, ground-based medical support and medical evaluation of proposed crewmembers. These objectives are supportive of the Center's responsibility for assuring astronaut health and safety, both during flight and on the ground. The accomplishment of these objectives requires a well-defined and continuing program that incorporates medical research, operations, laboratory support and clinical medicine.

The bioengineering activities provide integration of dedicated life sciences, Spacelab experiments and integration for human experiments. To this end, experiments will be selected, and experiment hardware development will be initiated.

SPACE APPLICATIONS

195 Permanent Positions (Civil Service)

The Earth Resources Survey Discipline is divided into three major areas: technology development, flight projects, and applications projects. JSC's responsibility entails the conduct and implementation of major tasks in each of these areas. Efforts are evenly divided among them and include the following specific activities:

1. Technology development is directed toward determining applications of remotely sensed data for agricultural crop identification, crop acreage and yield estimation, forest mapping and inventory, soil moisture measurement, and vegetation cover monitoring. Studies of data systems and techniques, applicable to these and other applications, are also being conducted. In addition, advanced aircraft multispectral scanners and imaging radars are being developed to support these investigations.

2. Flight project responsibilities at JSC include the airborne instrumentation research project and shuttle payload instrument development and integration. Responding to airborne measurement requirements, generated by NASA research and cooperative programs with the Departments of Agriculture, Interior, Defense, Commerce and Energy and various state agencies, JSC develops and implements an aircraft support plan. Involved is the testing, maintenance, and operation of a wide variety of remote sensors which provide data to investigators. Four aircraft, capable of data acquisition from 500 to 63,000 feet, are operated; a Lockheed C-130, two General Dynamics WB-57F's, and a Bell 206B helicopter. They are maintained at nearby Ellington Air Force Base.

Sensors currently being developed by JSC for flight on the Shuttle are the Large Format Stereo Camera and Spaceborne Imaging Radar. In addition, JSC is responsible for mission management of the OFT-2 payload which includes integration of equipment to the pallet, integrating the payload into the Orbiter, and real time mission support while in orbit.

3. Applications projects are being conducted with the Department of Interior's Bureau of Land Management to monitor wildland vegetation, the St. Regis Paper Company to map and inventory forestland, and the State of Texas to inventory statewide natural resources. Designated Applications Systems Verifications Tests (ASVT) are joint integrated tests to demonstrate, evaluate, and document specific applications on an operational basis. The objective is to transfer Aerospace Remote Sensing Systems and techniques to the public and private sectors.

A similar project, the Large Area Crop Inventory Experiment (LACIE) was completed in 1978 and the techniques transferred to a USDA facility near JSC. In-house USDA evaluations are being supported by JSC and efforts to extend the capability to other world crops are underway.

In addition to executing the above responsibilities, JSC functions as the Earth Resources Lead Center. This involves coordinating, integrating, planning, and evaluating all agency activities in this discipline. Recommendations are provided to NASA Headquarters, Office of Space and Terrestrial Applications regarding overall program content and budgetary requirements. In addition, long-range plans are developed and special studies conducted which address critical technical problems.

TECHNOLOGY UTILIZATION

4 Permanent Positions (Civil Service)

The Technology Utilization program transfers new knowledge and innovative technology resulting from NASA's R&D programs for application in industry, medicine and important public sector areas such as urban development. The Technical Planning Office at JSC provides program office direction for the Technology Utilization program at JSC and provides engineering support to analyze the feasibility of space application to ground-based operations, such as: telecare, feeding the elderly, and bioisolation garment.

SPACE RESEARCH AND TECHNOLOGY

10 Permanent Positions (civil Service)

Systems and design studies are being performed to provide the necessary analytical results which permit the successful transfusion of the technology developed under the research and technology base into systems and experimental programs. One example of this effort is the Orbiter Research and Technology Experiments Program (OEX); the intent of which is to collect research and technology data by utilizing the currently planned Developmental Flight Instrumentation (DFI) and Orbital Flight Instrumentation (OFI) configuration of the Orbiter Vehicle.

ENERGY TECHNOLOGY APPLICATIONS

35 Permanent Positions (Civil Service)

Engineering manpower will be used for Space Solar Power System Definition. This will involve in-house engineering definition studies and contract management. The studies will involve a systematic comparative assessment of power conversion options (photovoltaic versus thermal, silicon versus gallium arsenite, etc.); major systems trades such as the location of the space construction activity (low earth orbit versus geosynchronous orbit); and critical systems definition (rotary joint, phase control, etc.). Also, the studies will provide for a second iteration of elements and emphasize techniques of space construction, construction base definition, logistics and operations, and definition of required development program.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

538 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or service being provided to all Johnson Space Center organizations which cannot be directly identified to a specific benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Technical Planning, and Public Affairs.

Management Support - Includes a wide range of activity categorized as business management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control, and management information systems and analyses.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities
 Data processing and computer support
 Reliability and quality assurance
 Centerwide security and protection
 Fire protection
 Custodial services
 Logistics support including transportation, supplies, etc.
 Medical care of employees
 Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1977	1978		1979
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands	of Dollars)	
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>104,879</u>	<u>106,021</u>	<u>112,382</u>	<u>113,183</u>

Basis of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Permanent positions	92,686	92,752	98,261	99,050
b. Nonpermanent	1,142	1,476	1,438	1,134
c. Reimbursable detailees.. ..	975	1,114	1,327	1,905
d. Overtime and other compensation	<u>393</u>	<u>746</u>	<u>623</u>	<u>624</u>
Subtotal, Compensation	95,196	96,088	101,649	102,713

	1977 <u>Actual</u>	<u>1978</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 Budget <u>Estimate</u>
2. <u>Benefits</u>	<u>9,204</u>	<u>9,462</u>	<u>10,262</u>	<u>9,955</u>
Subtotal, Compensation and Benefits	<u>104,400</u>	<u>105,550</u>	<u>111,911</u>	<u>112,668</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	104	90	90	150
2. Personnel training	<u>375</u>	<u>381</u>	<u>381</u>	<u>365</u>
Subtotal, Supporting Costs	<u>479</u>	<u>471</u>	<u>471</u>	<u>515</u>
Total, Personnel and Related Costs.. ..	<u>104,879</u>	<u>106,021</u>	<u>112,382</u>	<u>113,183</u>
A. <u>Compensation and Benefits</u>	<u>104,400</u>	<u>105,550</u>	<u>111,911</u>	<u>112,668</u>
1. <u>Compensation</u>	<u>95,196</u>	<u>96,088</u>	<u>101,649</u>	<u>102,713</u>
a. Permanent positions	92,686	92,752	98,261	99,050

The funds shown above will support 3,546 permanent positions in 1979. Permanent personnel staffing during 1979 will increase from 1978 with the addition of the 20 astronauts and mission specialists for the Shuttle program.

Basis of Cost for Permanent Positions

In 1979 the cost of permanent positions will be \$99,050,000. This increase results from the following:

Cost of permanent positions in 1978.....	98,261
Cost increase in 1979.....	2,088

Partial year effect of new positions in 1979.....	+443
Within grade advances and career development	
Full year effect of 1978 actions.	+720
Partial year effect of 1979 actions.....	+802
Full year effect of 1978 pay raise.....	+123
Cost decreases in FY 1979.....	-1,299
Turnover savings and abolished positions:	
Full year effect of FY 1978 actions.	-1,103
Partial year effect of FY 1979 actions..	-196
Cost of permanent positions in FY 1979.....	<u>99,050</u>

	1977	1978		1979
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

b. Nonpermanent positions

1. cost.....	1,142	1,476	1,438	1,134
2. Workyears	154	185	161	125

The 1979 plan includes 125 workyears which is a reduction of 36 from the 1978 estimate. This effort will support the following programs as shown:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.....	75
Summer programs.....	13
Youth opportunity programs	26
Other temporaries	<u>11</u>
Total.....	<u>125</u>

The decrease in costs from the 1978 current estimate to the 1979 estimate is due to a reduction in the level of effort.

	1977	1978		1979
	<u>Actual</u>	Budget <u>Estimate</u> (Thousands	Current <u>Estimate</u> of Dollars)	Budget <u>Estimate</u>
c. Reimbursable detailees	975	1,114	1,327	1,905

The military personnel detailed to the Johnson Space Center on a reimbursable basis are individuals experienced in manned flight and related fields. Each individual performs an essential and critical function to the current and future programs.

Individuals with knowledge, experience and with a "flight" background, are essential to the manned flight programs. The individuals most readily available within the Government ranks are in the military. The additional requirement of keeping the military informed on manned space flight technology is also essential

One civilian employee, experienced in the field of medicine, is also detailed, on a reimbursable basis, to the Johnson Space Center.

The increase from FY 1978 to current estimate is due to the addition of 20 astronauts and mission specialists for the Shuttle program, bringing the total number to 57.

d. Overtime and other compensation	393	746	623	624
--	-----	-----	-----	-----

Overtime in FY 1979 will be used primarily for the orbital test flights, e.g., crew training, trajectory optimization, data reduction, integration laboratory, and related support activities. In addition, there are numerous source selection boards, earth resources application system verification programs and other activities that necessitate some extension of the normal work day or week.

2. <u>Benefits</u>	<u>9,204</u>	<u>9,462</u>	<u>10,262</u>	<u>9,955</u>
--------------------------	--------------	--------------	---------------	--------------

Following are the amounts of contribution by category:

Category of Costs

Contribution to the Civil Service Retirement Fund...	6,482	6,548	7,013	7,018
Contribution for employee life insurance.....	409	393	406	408
Contribution for employee health insurance..	1,815	1,793	1,818	1,824
Workman's compensation	331	564	565	572
Contribution to FICA.... ..	31	36	35	17

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
Incentive Awards	110	123	105	115
Other benefits..	1	5	1	1
Severance pay..	<u>25</u>	<u>---</u>	<u>319</u>	<u>---</u>
Total.	<u>9.204</u>	<u>9.462</u>	<u>10.262</u>	<u>9.955</u>

The increase from the 1978 budget estimate to the 1978 current estimate is due to the effect of 1978 pay increases and the inclusion of severance pay.

The decrease in 1979 is due to the lack of a requirement for severance pay.

B. <u>Supporting Costs</u>	479	471	<u>471</u>	<u>515</u>
1. Transfer of personnel	104	90	90	150

The increase in transfer of personnel in 1979 reflects the costs of transferring newly recruited astronauts and mission specialists for the Shuttle program.

2. Personnel training..	375	381	381	365
-------------------------------	-----	-----	-----	-----

Personnel training provides the training necessary to keep those employees with technological expertise abreast of the state of the art in their respective fields. The 1979 estimate is based on continuing the 1978 level of training with minor reductions.

TRAVEL

II. <u>TRAVEL</u>	<u>3.141</u>	<u>3.541</u>	<u>3.410</u>	<u>3.626</u>
-------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Program Travel.	2,638	3,021	2.784	3.072
-------------------------	-------	-------	-------	-------

	1977 Actual	1978 Budget Estimate (Thousands of Dollars)	1978 Current Estimate	1979 Budget Estimate
B. Scientific and Technical Development	156	134	165	175
C. Management and Operations Travel.	347	386	461	379
Total, Travel.... ..	<u>3.141</u>	<u>3.541</u>	<u>3.410</u>	<u>3.626</u>
A. <u>Program Travel</u>	<u>2,638</u>	<u>3,021</u>	<u>2,784</u>	<u>3,072</u>

Program travel is specifically required for the accomplishment of the Center's mission and accounts for 85 percent of the travel budget for 1979.

Program travel in 1979 will require about 7,670 trips, an increase of approximately 180 trips over those anticipated in 1978. Travel to support Space Shuttle development and production is expected to continue in 1979 at approximately the same level experienced in 1978. However, travel required to support Space Transportation System operations will increase, particularly in the area of payload development and coordination.

B. <u>Scientific and Technical Development</u>	<u>156</u>	<u>134</u>	<u>165</u>	<u>175</u>
--	------------	------------	------------	------------

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside JSC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. Approximately 430 trips are planned in 1979 to attend scientific and technical meetings. Symposia and technical seminars related to the earth observation program and lunar samples are a major requirement in this area. The level of travel in this category is expected to remain approximately the same as 1978.

C. <u>Management and Operations Travel</u>	<u>347</u>	<u>386</u>	<u>461</u>	379
--	------------	------------	------------	-----

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities, travel of the Center's top management to NASA Headquarters and other NASA Centers, and local transportation. The increase

from the 1978 budget to the 1978 current estimate is for astronaut preselection activities. The decrease in 1979 reflects the completion of those activities.

FACILITIES SERVICES

The Johnson Space Center (JSC) is located on 1,620 acres of ground with a complex of laboratory and office type buildings as well as test facilities. This complex encompasses 2,790,000 gross square feet of building space in 22 major buildings. Also included are 11 major technical facilities. This physical plant supports an average daily on-Center population of 7,100 to 7,500 personnel. Many of the test facilities are utilized on schedules involving more than one shift and off-peak hours.

The budget estimates also include certain resources associated with plant needs at the White Sands Test Facility, and for facilities used at Ellington Air Force Base under permit from the Air Force.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
III. <u>FACILITIES SERVICES</u>	<u>16,495</u>	<u>14,657</u>	<u>15,771</u>	<u>17,560</u>

Basis of Fund Requirements

A. Maintenance and Related Services

1. Facilities.....	6,434	5,117	5,514	6,540
2. Equipment.....	<u>458</u>	<u>366</u>	<u>350</u>	<u>410</u>
Subtotal.....	6,892	5,483	5,864	6,950
B. Custodial Services.....	3,705	2,913	3,002	2,378
C. Utility Services.....	<u>5,898</u>	<u>6,261</u>	<u>6,905</u>	<u>8,232</u>
Total, Facilities Services.....	<u>16,495</u>	<u>14,657</u>	<u>15,771</u>	<u>17,560</u>

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
A. <u>Maintenance and Related Services</u>	<u>6,892</u>	<u>5,483</u>	<u>5,864</u>	<u>6,950</u>
1. Facilities	6,434	5,117	5,514	6,540

This activity involves not only JSC facilities at Houston but also White Sands Test Facility and Ellington Air Force Base. It provides for 219 workyears of effort and is essentially a continuation of that level-of-effort to be provided in 1978. The increase in 1979 results from the full year effect of 1978 negotiated contractor wage rates and the need to provide 12 months funding in 1979. The major services included are:

a. Maintenance and operations to include routine maintenance of applicable facilities at:

JSC (98 workyears of effort)	2,691
WSIF (63 workyears of effort)	1,355

The above activity includes minor maintenance work including painting at JSC and Ellington Air Force Base.

b. Ground maintenance at JSC (24 workyears of effort)	387
---	-----

c. Facility design and engineering at JSC (20 workyears of effort). This also includes minor facility support to Ellington Air Force Base	481
---	-----

d. Supplies and facilities equipment	905
--	-----

This activity is mainly applicable to JSC and White Sands Test Facility with minor support to JSC activities at Ellington Air Force Base.

e. Routine facilities work	721
----------------------------------	-----

Routine facilities work is required at JSC, White Sands Test Facility and Ellington Air Force Base. It includes 14 workyears of effort to accomplish recurrent minor facility work tasks.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. Equipment.....	458	366	350	410

This activity is applicable to JSC, White Sands Test Facility and Ellington Air Force Base and involves mainly office-type equipment services by local businesses on an "as-needed" basis plus 1 workyear of effort required for the closed circuit TV maintenance.

B. <u>Custodial Services</u>	<u>3,705</u>	<u>2,913</u>	<u>3,002</u>	<u>2,378</u>
------------------------------------	--------------	--------------	--------------	--------------

This activity involves a total of 224 workyears of effort at JSC to provide for: janitorial services, including trash removal; fire protection services, including ambulance service; and security service. The decrease in 1979 estimates reflects a 37 workyear reduction associated with the conversion to a volunteer fire fighting force which will be coupled with support from the local community.

1. Janitorial services at JSC (151 workyears of effort)	1,136
---	-------

This activity is applicable to some 2.5 million square feet of area, relamping of light fixtures, trash removal (140-150 cubic yards per day) and minor laundry services.

2. Fire protection services at JSC (13 workyears of effort)	221
---	-----

This activity includes:

- Fire fighting, inspection and prevention
- Inspection and maintenance of fixed and mobile fire protection equipment
- Immediate first aid to onsite personnel, including visitors
- Transportation to onsite dispensary and/or local hospitals
- Training and supervision of a volunteer fire protection force.

1977 <u>Actual</u>	1978		1979
	Budget	Current	Budget
	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
(Thousands of Dollars)			

3. Security guard services at JSC (60 workyears of effort) 1,021

This activity includes badging of all onsite personnel and visitors; policing 13,000 vehicles which daily pass through the 5 security gates; and protection of all onsite Government facilities and equipment.

C. Utilities Services 5,898 6,261 6,905 8,232

The utilities involved in this activity are primarily electric power and natural gas with lesser needs for water and sewage services. These are provided for as follows:

1. Electricity 3,510

JSC (116,000 MW/Hrs.)
WSTF (10,000 MW/Hrs.)

2. Natural gas... 3,145

JSC (860,000 KCF)
WSTF (30,000 KCF)

3. Water.. 177

JSC (1.2 MGD)
WSTF (Government-owned wells)

4. Sewage.. 168

JSC (600,000 GPD)
WSTF (Government-owned treatment facility)

These services apply to both JSC and White Sands Test Facility, and includes \$7,000,000 for purchased utilities and \$1,232,000 (44 workyears of effort) to provide for the operation and maintenance related to the

JSC utility distribution systems. The increase in the 1978 current estimate from the 1978 budget results from rate increases not included in the budget. Usage remains as planned. The increase in 1979 results from the full year effect of 1978 rate increases partially offset by continued energy conservation.

TECHNICAL SERVICES

	<u>1977</u> <u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands	<u>1978</u> <u>Current</u> <u>Estimate</u> of Dollars)	<u>1979</u> <u>Budget</u> <u>Estimate</u>
IV. <u>TECHNICAL SERVICES</u>	<u>6,630</u>	<u>6,653</u>	<u>5,779</u>	<u>6,785</u>

Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment	1,512	1,708	2,273	2,249
2. Operations	<u>3,339</u>	<u>2,968</u>	<u>1,758</u>	<u>2,488</u>
Subtotal.....	<u>4,851</u>	<u>4,676</u>	<u>4,031</u>	<u>4,737</u>

B. Scientific and Technical Information

1. Library	99	73	75	81
2. Education and information	<u>516</u>	565	<u>629</u>	<u>688</u>
Subtotal.....	<u>615</u>	<u>638</u>	<u>704</u>	769

C. Shop Support and Services.....

Total, Technical Services.	<u>6,630</u>	<u>6,653</u>	<u>5,779</u>	<u>6,785</u>
---------------------------------	--------------	--------------	--------------	--------------

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
A. <u>Automatic Data Processing</u>	<u>4,851</u>	<u>4,676</u>	<u>4,031</u>	<u>4,737</u>

This activity provides accounting and management information data to satisfy requirements of NASA and JSC management and external authority. Included are support of all JSC administrative functions and the lease and maintenance costs of all multiuse ADP equipment within JSC's Central Computer Facility.

1. Equipment	1,512	1,708	2,273	2,249
--------------------	-------	-------	-------	-------

The 1979 estimate for equipment provides for the maintenance costs of all JSC-owned ADP equipment and the lease costs of all leased ADP hardware within the Central Computer Facility. These hardware systems include four Univac 1108's, one Univac 9300, one IBM 360/22, one IBM 360/30, one CDC 3200, and one Mohawk (data entry) computer system. Also included is the associated peripheral equipment such as two microfilm processors, various terminals, and keypunch machines. No equipment purchases are planned for 1979.

2. Operations	3,339	2,968	1,758	2,488
---------------------	-------	-------	-------	-------

ADP systems supported include Institutional Management, Financial and Accounting, Procurement Tracking and Contractual Status, Personnel Management Information, and Utility Control.

a. Computer programming requiring 26 workyears of effort at a cost of \$880 thousand are required for 1979.

b. Keypunch, operators, and other support personnel requiring 45 workyears and purchased supplies, materials, and software programs for a total of \$1,608,000.

This is a continuation of the same level of effort as in 1978. The 1979 increase is required to provide a full 12-months funding, and the full year effect of negotiated contractor wage rates.

B. <u>Scientific and Technical Information</u>	<u>615</u>	<u>638</u>	<u>704</u>	<u>769</u>
--	------------	------------	------------	------------

This activity, requiring 38 support contractor workyears, provides for the operation of a technical library at JSC, a public affairs educational/informational program, and support to the Center in the provision of various scientific and technical information services. The increase from 1978 reflects the full year cost of increased wage rates.

	1977	1978		1979
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. Library	99	73	75	81

Six workyears of contract support provide cataloging and indexing services and provide initial distribution of publications in the operation of the JSC Technical Library. This includes, on a monthly basis, cataloging about 170 books, indexing approximately 730 reports, and distributing about 50,000 publications.

2. Education and information.....	516	565	629	688
-----------------------------------	-----	-----	-----	-----

Thirty-two workyears of support contractor effort are required to support the JSC public affairs program. Included are: exhibit management and refurbishment; visitor orientation tours, and lecturing; mail answering services; and other activities.

C. <u>Shop Support and Services</u>	1,164	1,339	<u>1,044</u>	<u>1,279</u>
---	-------	-------	--------------	--------------

Fifty workyears of support contractor effort are required to provide the Center with support in the areas of graphics, publications, and audiovisual material. Micro-images are prepared from hard copy and vice-versa. Editorial services are provided for JSC publications. Graphic materials are prepared for use in presentations and senior management meetings. Motion pictures, from script to screen, and film clips are produced to support Center Management and Public Affairs. Various kinds of film are processed and reproductions and reprints made. The increase in 1979 provides for a full year's funding of the support contracts.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u>	8,343	8,709	<u>8,533</u>	<u>9,142</u>
---	-------	-------	--------------	--------------

Basis of Fund Requirements

A. Administrative Communications.....	2,458	2,489	2,601	2,737
B. Printing and Reproduction.	724	500	685	572

	1977 <u>Actual</u>	1978 Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 Budget <u>Estimate</u>
C. Transportation..	659	831	806	814
D. Installation Common Services.....	<u>4,502</u>	<u>4,889</u>	<u>4,441</u>	<u>5,019</u>
Total, Management and Operations	<u>8,343</u>	<u>8,709</u>	<u>8,533</u>	<u>9,142</u>

A. <u>Administrative Communications.</u>	<u>2,458</u>	<u>2,489</u>	<u>2,601</u>	<u>2,737</u>
--	--------------	--------------	--------------	--------------

Communications support for JSC and White Sands Test Facility (WSTF) consist of local telephone service, long distance telephone service, and various kinds of other nontelephone communications. The same level of support is projected for 1979 as in 1978, and the increase is related to the full year cost of 1978 rate increases.

1. Local telephone services	1,315
-----------------------------------	-------

The major part of this covers 3,580 Centrex lines and 6,330 telephone instruments at JSC. Also included are 292 telephones at WSIF and local telephone services at: Draper Labs, Cambridge, MA; Grumman, Bethpage, NY; and Space and Missiles Systems Organization (SAMS0), El Segundo, CA. About 175 local circuits at JSC and two at WSIF (Fire Alarms, Burgular Alarms, Public Address, Data, etc.) are included within this category.

2. Long distance telephone service	842
--	-----

a. The Federal Telecommunications System (FTS) use was 689,251 calls in 1977.

b. Tolls or commercial long distance calls are about 1,000 a month at JSC and five a month at WSTF.

c. Four leased lines are employed: two circuits from WSIF to Las Cruces, NM, and two circuits from JSC to GSA in Austin, TX. All are teletype circuits except the WSTF/Las Cruces, NM, which are voice.

3. Nontelephone communications	580
--------------------------------------	-----

a. Postage: \$450 thousand is required in 1979 and accounts for the largest portion of this category.

b. The remaining cost of \$130 thousand covers the Western Union Lease costs, DOD Classified Teletype Network Access costs, TWX or message charges, UPI Wire Service for the Public Affairs Office, and eight radio networks .

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u>		1979 <u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
B. <u>Printing and Reproduction</u>	<u>724</u>	<u>500</u>	685	<u>572</u>

JSC's basic printing requirements are handled by maintaining an onsite printing plant operated by JSC personnel. This printing plant produces approximately 36,000,000 units of printing each year. In addition to this onsite printing plant, JSC must also purchase from private firms, through Government Printing Office contracts, about 43,000,000 units of printing each year. This purchased printing is a combination of an overflow requirement that cannot be handled with the onsite workload and often is of a type that cannot be handled with the limited capability of the onsite equipment.

C. <u>Transportation</u>	<u>659</u>	831	<u>806</u>	<u>814</u>
--------------------------------	------------	-----	------------	------------

Transportation functions at JSC involve seven workyears of support contractor effort and include aircraft maintenance, ground vehicle maintenance, and lease of trucks from General Services Administration (GSA). The level of effort in 1979 will be the same as 1978.

D. <u>Installation Common Services</u>	<u>4,502</u>	<u>4,889</u>	<u>4,441</u>	<u>5,019</u>
--	--------------	--------------	--------------	--------------

These services, requiring 164 workyears of support contractor effort, support Center Management and staff activities, provide medical services, and cover various installation support services. The increase from 1978 reflects the requirement to provide 12 months funding in 1979 and the full year cost of increased contractor wage rates. The level of effort does not increase in 1979.

1. Center management and staff	38
--------------------------------------	----

Provides for patent searches and applications.

2. Medical services....	1,083
-------------------------	-------

This activity provides support in *two* main categories: occupational medicine, and environmental health. Total support contractor workyears required is 39.

a. Occupational medicine..... 770

Occupational medicine consists of operation of the JSC onsite clinic, emergency assistance at Ellington Air Force Base (EAFB), providing JSC physicals at Downey, California, medical consultation and crew test support. Total workyears are 26.

b. Environmental health.. 313

Environmental health consists of industrial hygiene, radiological health, and an environmental health lab which requires 13 workyears.

3. Installation support services 3,898

Included here, requiring 125 workyears of support contractor effort, are all administrative support services not specifically identified elsewhere. Among these services are the purchase of administrative supplies and equipment, the cataloging of supplies and equipment, warehousing and storage, moving and hauling, forms distribution, vehicle drivers and dispatchers, Ellington Air Force Base (EAFB) support, and many smaller miscellaneous services.

a. Administrative supplies, materials and equipment..... 1,691

Included in this category are supplies, materials and equipment that are used to support the administrative functions at JSC and WSIF.

b. Cataloging of supplies and equipment 287

Twenty workyears are required for identification and cataloging requests for supplies into the proper Federal Supply Groups, placing orders on the proper Federal Schedule Contracts, maintaining a stores stock catalog, etc.

c. Warehousing and storage 862

Sixty workyears are needed to operate a central receiving depot for supplies, a warehousing and storage function (including bonded storage and storage of hazardous materials) and a stock issuance service.

d. Moving and hauling 547

Thirty-eight workyears are required to handle shipping and packing of supplies and equipment both locally and for long distance movement, moving and hauling of items locally, and delivery of items purchased from local firms.

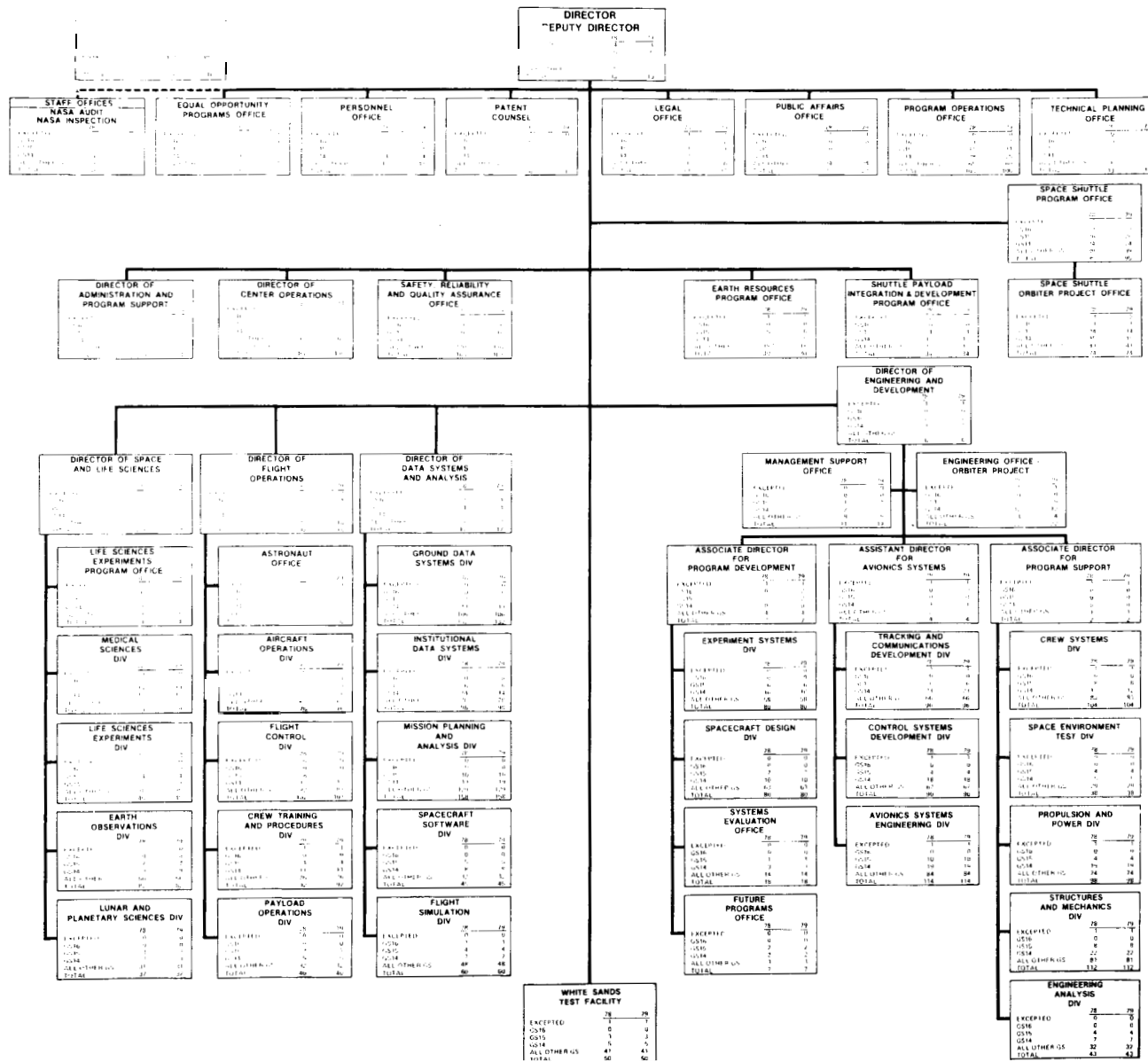
e. Forms distribution..... 96

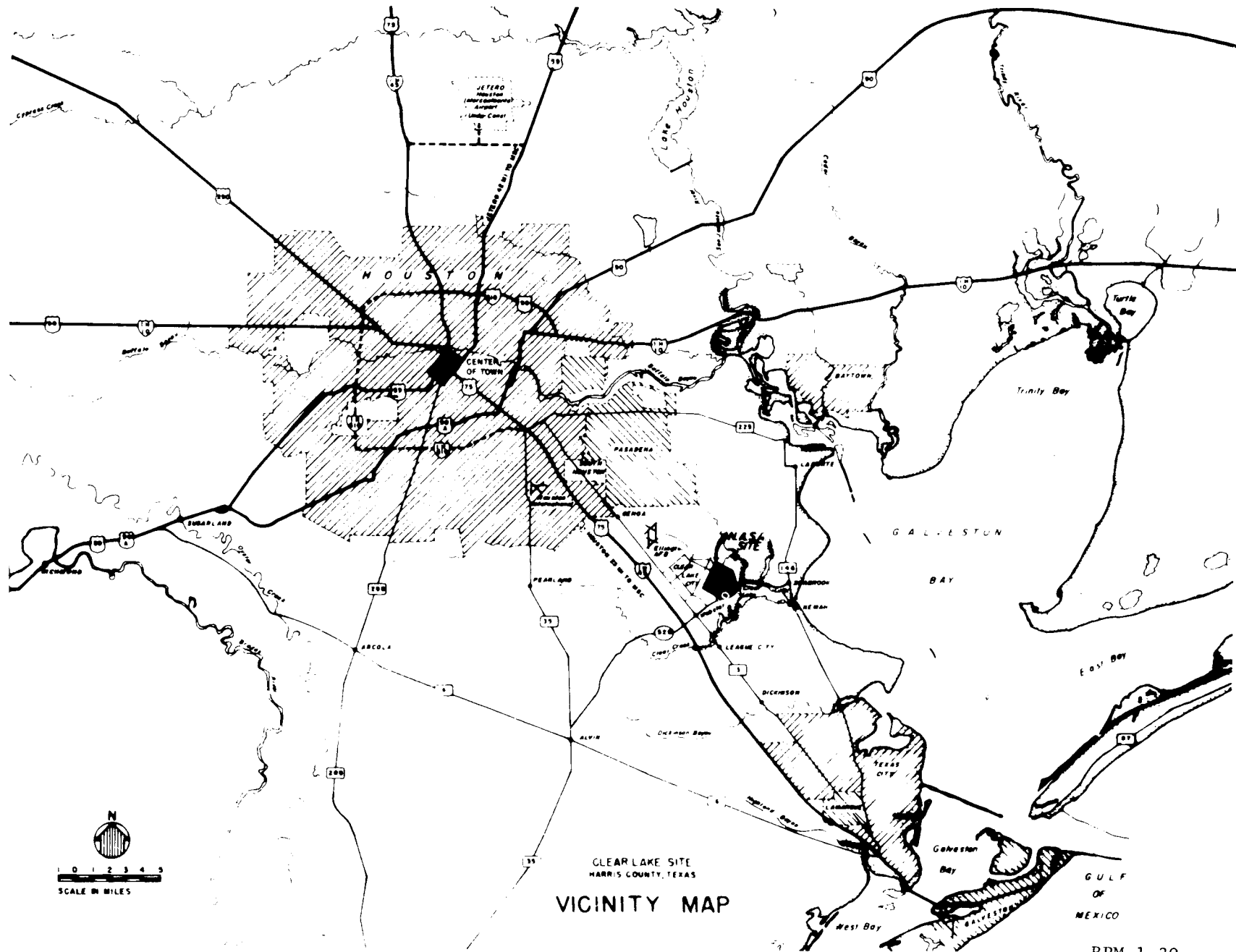
Seven workyears are required for the distribution of approximately 600,000 forms and publications each year

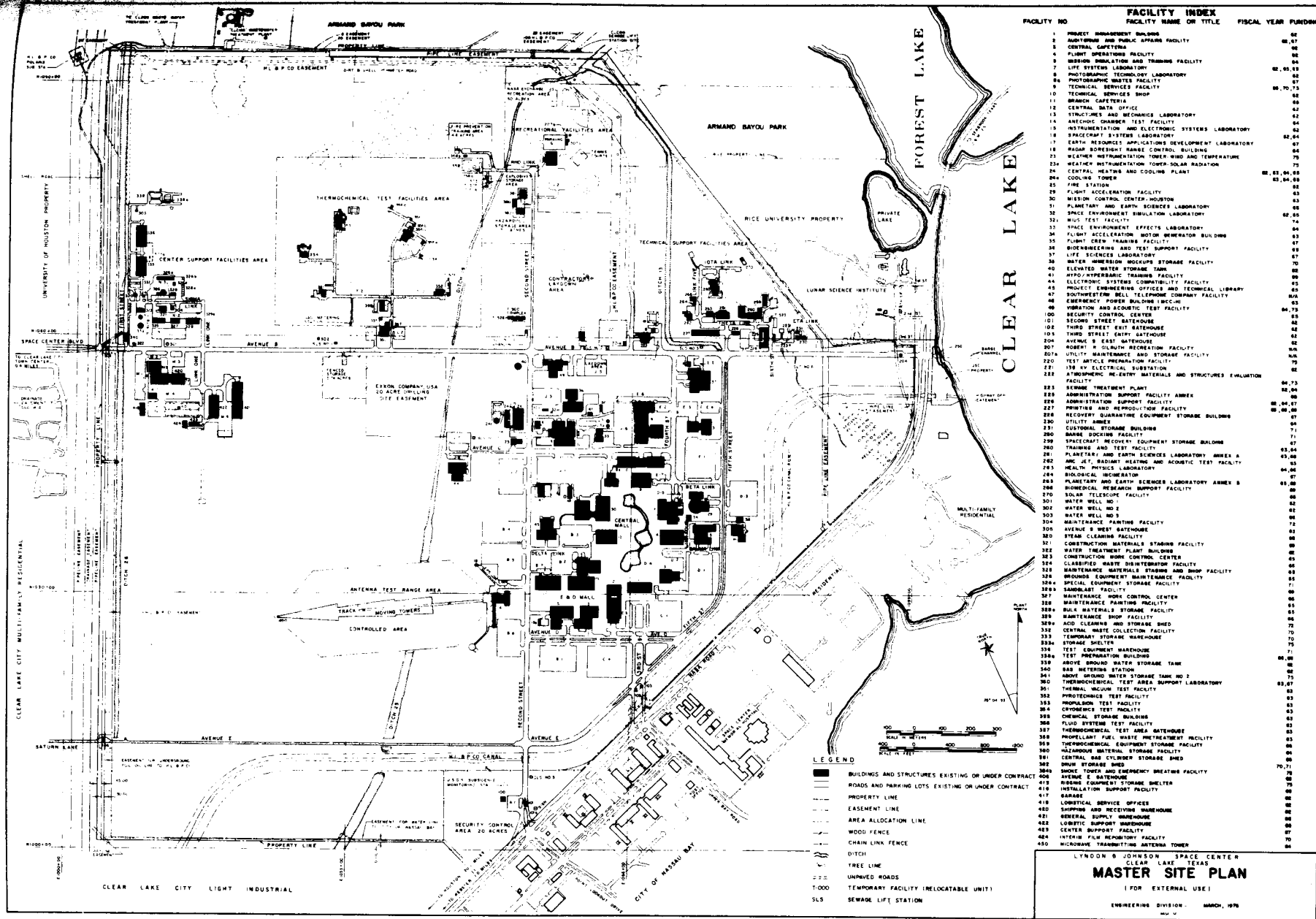
f. Administrative support..... 415

This category covers the cost of local transportation within the JSC area as provided by GSA, the JSC share of operating costs at the nearby Ellington Air Force Base, and the costs of waste inspection services, court stenographic services and torts and claims.

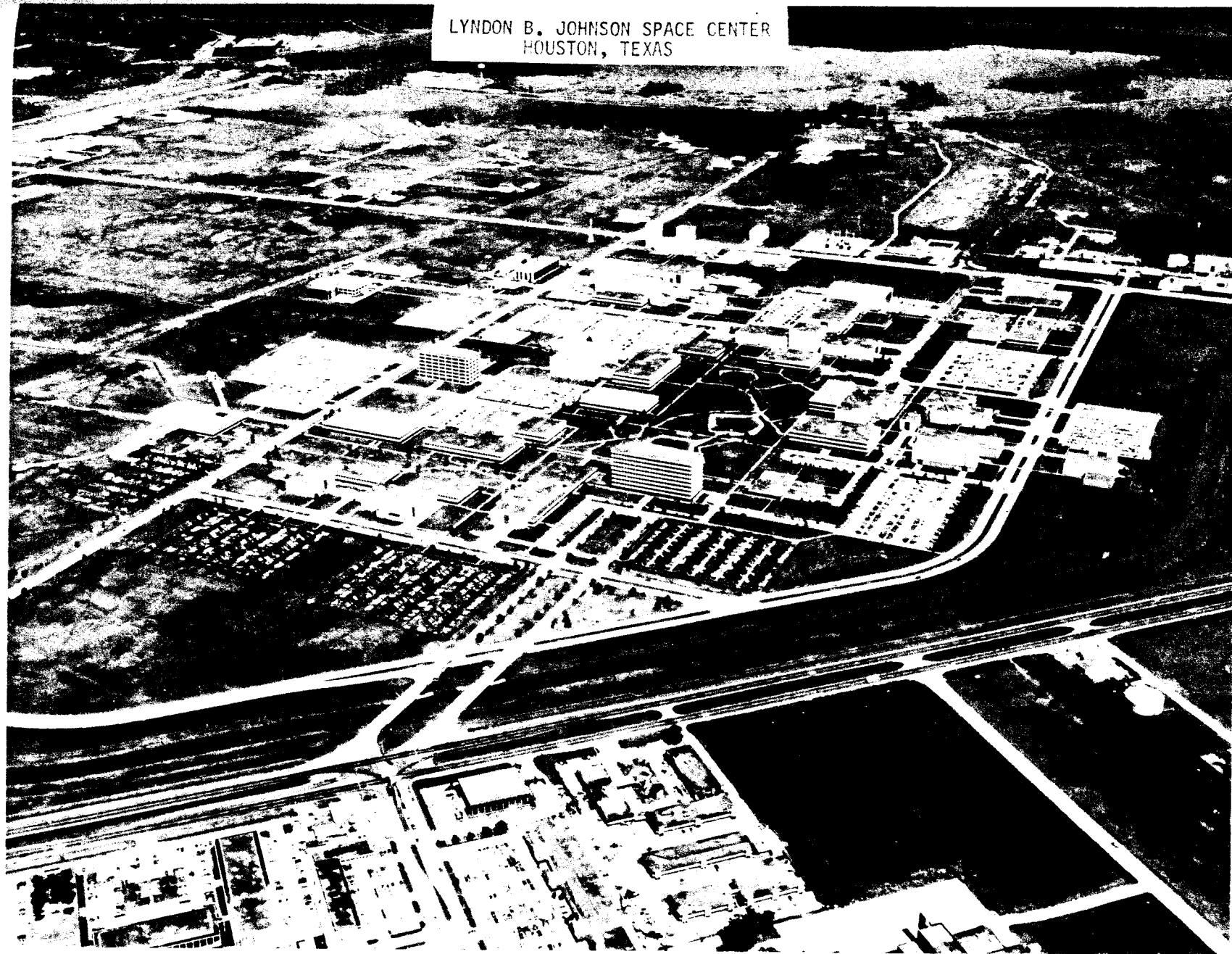
**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS**







LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

JOHN F. KENNEDY SPACE CENTER

DESCRIPTION

The John F. Kennedy Space Center is located approximately 50 miles east of Orlando, Florida. The total land and water area occupied by the installation is 139,305 acres. NASA owns 82,943 acres of that total. The remainder is comprised of the Banana River Causeway Easement (271 acres), the Indian River Causeway Easement (296 acres), and Florida-owned submerged lands with Deed of Dedication (55,795 acres).

Expendable launch vehicle operations are conducted at both the Air Force Eastern Test Range, Cape Canaveral Air Force Station; and the Western Test Range at Vandenberg Air Force Base, California, which is located 6 miles west of Lompoc, California. Space Shuttle flights will begin at KSC in 1979 and at Vandenberg in 1983.

The capital investment at the Kennedy Space Center and the Western Test Range, including fixed assets in progress and contractor-held facilities as of September 30, 1977, was \$1,461,954,000.

CENTER ROLES AND MISSIONS

The Kennedy Space Center (KSC) was established at Cape Canaveral, Florida, in July 1962 to serve as the primary NASA center for the test, checkout, and launch of space vehicles. This site was chosen because of its unique geographical characteristics, climate, local growth capability, accessibility, and availability. The Center has since grown to become the major Free World launch site with a unique civil service staff of unparalleled expertise in the field of test, checkout, and launch of space vehicles and in the design of associated ground support equipment. The technical facilities developed at KSC represent a recognized national resource. The principal roles are:

Space Transportation System (STS) Ground Operations - includes launch operations, Solid Rocket Booster (SRB) retrieval, STS refurbishment and turnaround, Levels I and II integration, Spacelab Level III integration, integrated logistics and transportation and postlanding operations, and flight line medical and biomedical support.

STS Sustaining Engineering - includes configuration management, operational hardware accommodations and modifications.

Expendable Vehicle Launch Operations - includes launch preparations, checkout, and range safety for the current inventory of launch vehicles.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
I. Personnel and Related Costs	60,962	61,817	65,608	66,705
11. Travel	2,230	2,418	2,412	2,338
III. Facilities Services	25,321	25,056	23,967	27,906
IV. Technical Services	6,015	5,564	6,195	6,182
V. Management and Operations	<u>15,214</u>	<u>15,286</u>	<u>14,367</u>	<u>15,300</u>
Total, Fund requirements	<u>109,742</u>	<u>110,141</u>	<u>112,549</u>	<u>118,431</u>

Distribution of Permanent Positions by Program

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
Direct Positions				
<u>Space Transportation Systems</u>	<u>1,652</u>	<u>1,680</u>	<u>1,633</u>	<u>1,654</u>
Space shuttle	1,083	1,091	1,066	1,089
Space flight operations	398	327	410	434
Expendable launch vehicles	171	262	157	131
<u>Space Sciences</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>
Life sciences	3	4	3	3
<u>Space and Terrestrial Applications</u>	<u>18</u>	<u>22</u>	<u>17</u>	<u>17</u>
Space applications	13	21	12	12
Technology utilization	<u>5</u>	<u>1</u>	<u>5</u>	<u>5</u>
Subtotal. direct positions	1,673	1,706	1,653	1,674
<u>Center Management and Operations Support Positions</u>	<u>557</u>	<u>553</u>	<u>533</u>	<u>533</u>
Total. permanent positions	<u>2,230</u>	<u>2,259</u>	<u>2,186</u>	<u>2,207</u>

PROGRAM DESCRIPTION

SPACE SHUTTLE

1,089 Permanent Positions (Civil Service)

The Kennedy Space Center has been assigned the Launch and Landing Project of the Space Shuttle program. Major roles for the accomplishment of this responsibility include launch systems development and STS ground operations. In the performance of these roles, 1979 will represent the period of greatest activity at KSC since completion of the Apollo program. Orbiter 102 will be delivered for integration and stacking with the external tank and solid rocket boosters, checkout and launch of the first manned orbital flight in 1979. Preparation will be in progress for additional orbital test flights during 1979.

Construction of new launch support facilities and modification of existing facilities will continue in 1979. Installation and checkout of support equipment in preparation for scheduled flights will also take place. Major facilities involved are:

Orbiter Landing Facility (OLF)

Ground support equipment installation and checkout will be completed and the installation of operational television (OTV) started. These systems will support Shuttle landings after the fourth orbital flight test.

Orbiter Processing Facility (OPF)

Integration and checkout of hypergol systems in the Low Bay and High Bay 1 will be completed in time for Orbital Flight Test (OFT) 1. Support equipment integration and checkout in High Bay 2 will commence.

Vehicle Assembly Building (VAB)

Modification of support systems and equipment in preparation for full Shuttle operations.

Mobile Launcher Platforms (MLP)

MLP 1 becomes operational in 1979 with construction/modification of MLP 2 ongoing.

Solid Rocket Booster (SRB) Disassembly Building

Integration and checkout of the support equipment installed in this facility will be completed and the activity operational in 1979.

Solid Rocket Booster (SRB) Parachute Building

Support equipment integration and checkout will be completed.

In addition to activity involving major facilities, KSC is also responsible for the design, acquisition and installation of equipment to be used in support of the Shuttle. This includes not only that equipment to be designed by KSC contractors, but also that to be supplied by the development contractors as part of their flight vehicle contract. KSC is also responsible for the refurbishment of selected existing support equipment for reuse on the Shuttle program.

A new category of support equipment is the Launch Processing System (LPS). This automated checkout system, conceived and developed by KSC is a major innovation in the checkout and launch of sophisticated space vehicles. This system will not only provide automated checkout capability for the Shuttle vehicle, but also provides engineering data for operations and management decisions. It will become operational for orbital test flights.

SPACE FLIGHT OPERATIONS

434 Permanent Positions (Civil Service)

The conduct of the space flight operations program at KSC includes Spacelab, Interim Upper Stages, Payload support and multimission support that may be assigned for Shuttle flight operations.

KSC has a role in the Spacelab program similar to that of the Shuttle; that is, KSC is responsible for launch site development and for ground operations. Preparation for Spacelab activity in 1979 will begin with the critical design and qualification review starting in 1978 and delivery of the engineering model in 1979. The Spacelab flight unit will be delivered to NASA in the latter part of 1979. In addition, KSC must prepare for the additional task of analytical engineering. Responsibility for this task of ensuring that the experiments which are mounted on or in the Spacelab are compatible with the Spacelab, with each other, and with safety requirements will transfer to KSC for the third Spacelab mission.

Under current plans the Spinning Solid Upper Stages (SSUS) will be developed, checked out and mated to a payload by the SSUS commercial developer. KSC will have responsibility for integration of the SSUS and its payload canister and then into the Shuttle payload bay.

KSC will provide facilities and support to the various payload developers and experimenters during processing at KSC. Thus, KSC, in consort with other NASA organizations must analyze potential payload requirements, identify payload facility capability at KSC, and prepare documentation for potential payload users. Based on experience gained during the Expendable Launch Vehicle program, KSC will monitor the payload activity from conception, participate in design reviews to ensure compatibility with KSC facilities, and provide support coordination during the payload checkout and launch at KSC.

The primary activity in 1979 will be in the integration and checkout of support equipment required in the interfacing of payloads with the STS.

The second major role for KSC in the Shuttle program in addition to ground system development is that of ground operations. This includes the test and checkout of each flight element as it arrives at KSC for development flight testing, the integration of the several elements (Orbiter, External Tank, Solid Rocket Booster) into the Shuttle vehicle and integrated testing of the stacked configuration, propellant loading, and launch. Subsequent to landing, KSC will refurbish the Orbiter in preparation for the next mission. Also included is retrieval, disassembly, and refurbishment of the expended solid rocket boosters. Since the initial orbital flight test launches will land at Dryden Flight Research Center (DFRC), provisions will be made for the ferrying of the Orbiter back to KSC (for maintenance and launch).

The upper stages consist of the Interim Upper Stage (IUS) and the Spinning Solid Upper Stage (SSUS). Both are expendable, propulsive stages intended for use in the development of Shuttle transported payloads to high energy orbits not attainable by the Shuttle alone.

The Interim Upper Stage (IUS) is being developed by the Air Force and will be operational in 1980. KSC will be responsible for mating the Spacecraft to the IUS. Critical design review of the IUS integration activities will be conducted in early 1979 with the first delivery of hardware in late 1979.

EXPENDABLE LAUNCH VEHICLES

131 Permanent Positions (Civil Service)

KSC is responsible for the launch preparation and checkout of the current inventory of expendable launch vehicles. This includes the Atlas Centaur and Delta. Launches at both the Eastern Test Range and the Vandenberg Air Force Base are the responsibility of KSC.

LIFE SCIENCES

3 Permanent Positions (Civil Service)

In 1979 the Kennedy Space Center will continue its support role in the definition, development, and integration of biomedical experiments into Shuttle payloads for life sciences research. These experiments are designed to use the environment of space to accomplish medical and biological research for benefit of man through technological advancement of the state-of-the-art.

SPACE APPLICATIONS12 Permanent Positions (Civil Service)

In the field of Earth Resources, KSC will continue in 1979 with the development of remote sensing applications involving thermal pollution, and in developing methods of sensing and predicting areas of crop freeze for the Florida Citrus Industry.

In the area of specialized application tasks, KSC will be performing studies related to requirements, procedures, and techniques of processing space applications payloads for Spacelab.

TECHNOLOGY UTILIZATION5 Permanent Positions (Civil Service)

The objectives of the Technology Utilization program at KSC are to encourage the use of and to expedite the application of new NASA technology in other sectors, and to impart a better understanding of the technology transfer process and its potential impacts.

CENTER MANAGEMENT AND OPERATIONS SUPPORT533 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as the support or services being provided to all Kennedy Space Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and the immediate staff, e.g. Legal, Patent Counsel, Equal Opportunity, Planning and Analysis, Public Affairs (includes operation of the Visitors Information Center and its related NASA tours activity), and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management resource control and management information systems and analysis,

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities
Data processing and computer support

RPM 2-7

Reliability and quality assurance
Centerwide security and protection
Fire protection
Custodial services
Logistics support including transportation, supplies, etc.
Medical care of employees
Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>60.962</u>	<u>61,817</u>	<u>65,608</u>	<u>66,705</u>
<u>Basis of Fund Requirement</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions	54,304	54,770	58,464	58,836
b. Nonpermanent	646	785	743	841
c. Reimbursable detailees	127	139	179	179
d. Overtime and other compensation... ..	<u>248</u>	<u>355</u>	<u>252</u>	<u>442</u>
Subtotal, Compensation	55,325	56,049	59,638	60,298
2. Benefits	<u>5,278</u>	<u>5,427</u>	<u>5,705</u>	<u>5,874</u>
Subtotal, Compensation and Benefits.	<u>60,603</u>	<u>61,476</u>	<u>65,343</u>	<u>66,172</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	157	116	160	258
2. Personnel training	<u>202</u>	<u>225</u>	<u>105</u>	<u>275</u>
Subtotal, Supporting Costs.. ..	<u>359</u>	<u>341</u>	<u>265</u>	<u>533</u>
Total, Personnel and Related Costs.....	<u>60,962</u>	<u>61,817</u>	<u>65,608</u>	<u>66,705</u>

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> (Thousands of Dollars)	1978 <u>Current Estimate</u> (Thousands of Dollars)	1979 <u>Budget Estimate</u>
A. <u>Compensation and Benefits</u>	<u>60,603</u>	<u>61,476</u>	<u>65,343</u>	<u>66,172</u>
1. <u>Compensation</u>	<u>55,325</u>	<u>56,049</u>	<u>59,638</u>	<u>60,298</u>
a. Permanent positions	54,304	54,770	58,464	58,836

The funds shown above will support 2,207 permanent positions in 1979. Permanent personnel staffing will increase from 1978 with the addition of 21 personnel to support the development flights.

Basis of Cost for Permanent Positions

In 1979 the cost of permanent positions will be \$58,836,000. The increase results from the following

Cost of permanent positions in 1978.	58,464
Cost increase in 1979.....	1,473
Partial year effect of new positions in 1979..	+158
Within grade advances and career development:	
Partial year effect of 1979 actions.....	+623
Full year effect of 1978 actions.	+614
Full year effect of 1978 pay increases.....	+74
Change in reimbursable activity	+4
Cost decrease in 1979..	-1,101
Turnover savings and abolished positions:	
Full year effect of 1978 actions.....	-940
Partial year effect of 1979 actions..	-161
Cost of permanent positions in 1979.....	<u>58,836</u>

	1977	1978		1979
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
b. Nonpermanent positions				
1. cost	646	785	743	841
2. Workyears	87	103	93	103

The increase from the 1978 estimate to the 1979 estimate is required to bring temporary programs back to the planned level. The level of 103 workyears is distributed to the following programs:

Distribution of Nonpermanent Workyears

<u>Programs</u>	<u>Workyears</u>
Cooperative training programs.....	45
Summer programs..	15
Youth opportunity programs.....	21
Other temporaries	<u>22</u>
Total.....	<u>103</u>
c. Reimbursable detailees..	127
	139
	179
	179

Includes funding for services of five engineers and one logistician who will participate in Shuttle development, i.e., maintainability and flight test support. These employees are detailed to KSC from the Department of Defense because of their special expertise in areas such as retrieval ships and logistics, to help in the Shuttle planning and development phases.

d. Overtime and other compensation... ..	248	355	252	442
--	-----	-----	-----	-----

The increase in overtime estimates from 1978 to 1979 is required to meet the increased schedule demands for preparation and checkout activities for launch of the first STS vehicle which arrives at the beginning of 1979. A two-shift operation will begin with arrival of the flight hardware whereas previous activities could be done with a single shift.

	1977 <u>Actual</u>	1978 Budget <u>Estimate</u> (Thousands of Dollars)	1978 Current Estimate (Thousands of Dollars)	1979 Budget <u>Estimate</u>
2. <u>Benefits</u>	<u>5,278</u>	<u>5,427</u>	<u>5,705</u>	<u>5,874</u>
<u>Category of Cost:</u>				
Civil Service Retirement Fund... ..	3,821	3,862	4,063	4,177
Employee life insurance	245	261	261	266
Employee health insurance	1,039	1,073	1,082	1,120
Workman's compensation	112	191	192	192
FICA.. ..	14	27	22	24
Incentive awards	40	13	73	95
Severance pay.....	<u>7</u>	<u>---</u>	<u>12</u>	<u>---</u>
Total	<u>5,278</u>	<u>5,427</u>	<u>5,705</u>	<u>5,874</u>

The increase from the 1978 budget estimate to the 1978 current estimate is due to the effect of pay increases. The increase from 1978 to 1979 is primarily due to the addition of 21 positions planned in 1979.

B. <u>Supporting Costs</u>	<u>359</u>	<u>341</u>	<u>265</u>	<u>533</u>
1. Transfer of personnel	157	116	160	258

The increase in transfer of personnel from 1978 to 1979 is due to the recruitment and transfer of the additional personnel to support the preparation, payload support, and launch of the Shuttle Orbiter. The 1979 estimate provides for 62 relocations at an average of \$4,200 each. The increase results from the permanent personnel buildup from 2,186 to 2,207 positions.

2. Personnel training	202	225	105	275
-----------------------------	-----	-----	-----	-----

The increase in personnel training from 1978 to 1979 is to restore the training requirements after a management decision to reduce the level in 1978 to provide funds for cost increases in other areas. These funds provide the means to maintain proficiency in various skills, to provide the necessary training for those employees with technological expertise to keep abreast of the state-of-the-art in their respective fields, and to meet career development needs.

TRAVEL

	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
11. <u>TRAVEL</u>	<u>2,230</u>	<u>2,418</u>	<u>2,412</u>	<u>2,338</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel	1,373	1,317	1,354	1,274
B. Scientific and Technical Development	14	17	22	24
C. Management and Operations	<u>843</u>	<u>1,084</u>	<u>1,036</u>	<u>1,040</u>
Total, Travel	<u>2,230</u>	<u>2,418</u>	<u>2,412</u>	<u>2,338</u>
A. <u>Program</u> Travel	<u>1,373</u>	<u>1,317</u>	<u>1,354</u>	<u>1,274</u>

Program travel is directly related to the accomplishment of the Center's mission and accounts for 55 percent of the travel budget. Approximately 2,750 trips will be required to carry out the Kennedy Space Center responsibilities in this category. Program travel has reflected the Center's involvement in the design and manufacturing of Shuttle ground system equipment, design and construction of Shuttle facilities, and the activation of systems manufactured at off-site locations. During 1979, our effort will shift to test and checkout of the Orbiter and launch systems leading to the first manned orbital flight. Extensive travel to development Centers and manufacturers' sites will be necessary to resolve problem areas and assure the operation capability of all systems for which KSC is responsible. KSC will travel for payload requirements validation and payload development and for orbiter flight kit development and manufacturing.

The reduction from 1978 to 1979 reflects the completion of the Shuttle Approach and Landing Test at the Dryden Flight Research Center and the reduced travel required during the deactivation process.

B. <u>Scientific and Technical Development</u>	<u>14</u>	<u>17</u>	<u>22</u>	<u>24</u>
--	-----------	-----------	-----------	-----------

Scientific and technical development travel permit employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit

from exposure to technological advances outside KSC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. It is planned that 1979 travel for this category will be essentially the same as 1978.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
C. <u>Management and Operations</u>	<u>843</u>	<u>1,084</u>	<u>1,036</u>	<u>1,040</u>

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management and procurement activities; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. Approximately 990 trips are planned for 1979, and will be at the same level as in 1978.

FACILITIES SERVICES

Kennedy Space Center (KSC) is located on 139,305 acres of grounds and a complex of facilities which are mainly made up of test and office type buildings as well as launch operations facilities. This complex encompasses 5,100,000 gross square feet of building space including 13 major buildings. Also included are 14 major technical facilities. This plant supports an average daily on-Center population of 7,500 to 8,100 personnel onsite. Many of the test facilities are utilized during off-peak hours or on more than one shift.

The budget estimate also includes plant needs at its component installation, the Vandenberg Air Force Base.

111. <u>FACILITIES SERVICES</u>	<u>25,321</u>	<u>25,056</u>	<u>23,967</u>	<u>27,906</u>
---------------------------------------	---------------	---------------	---------------	---------------

Basis of Fund Requirements

A. Rental of Real Property	<u>1</u>	<u>2</u>	<u>5</u>	<u>10</u>
B. <u>Maintenance and Related Services</u>				
1. Facilities.	8,908	6,406	7,186	7,343
2. Equipment	<u>617</u>	<u>632</u>	<u>553</u>	<u>603</u>
Subtotal	<u>9,525</u>	<u>7,038</u>	<u>7,739</u>	<u>7,946</u>

	1977 <u>Actual</u>	1978		1979 <u>Budget</u>
		<u>Estimate</u>	<u>Current</u>	<u>Estimate</u>
		(Thousands	of Dollars)	
C. Custodial Services.....	<u>7,412</u>	<u>9,133</u>	<u>7,576</u>	<u>10,299</u>
D. <u>Utility Services</u>	<u>8,383</u>	<u>8,883</u>	<u>8,647</u>	<u>9,651</u>
Total, Facilities Services...	<u>25,321</u>	<u>25,056</u>	<u>23,967</u>	<u>27,906</u>

A. <u>Rental of Real Property</u>	<u>1</u>	<u>2</u>	<u>5</u>	<u>10</u>
---	----------	----------	----------	-----------

This provides for the rental of off-site facilities for news and reception center activities associated with launches. The increase in 1979 reflects the needs of the Shuttle launch activities, including the first manned orbital flight test of the Space Shuttle.

B. <u>Maintenance and Related Services</u>	<u>9,525</u>	<u>7,038</u>	<u>7,739</u>	<u>7,946</u>
1. Facilities.....	8,908	6,406	7,186	7,343

This activity involves the operations and maintenance of applicable facilities at KSC, Cape Canaveral Air Force Station, and Vandenberg Air Force Base. The size, complexity and wide geographical dispersion of these facilities places heavy demands on facilities services. The slight increase in the 1979 budget estimate as compared to the 1978 current estimate is due to a combination of labor rate increases and reduced availability of prior year resources, partially offset by a reduction of one workyear at Vandenberg Air Force Base.

a. Maintenance and operation of facilities (118 workyears).....	3,992
---	-------

This activity includes, in addition to the normal activities associated with facility maintenance or management of direct maintenance personnel, the responsibilities for management of real estate records and like matters, space utilization, utility rate study and analysis as well as corrosion control and cathodic protection activities.

In addition, there are minor facility related services for such items as payment of certification fees for facility maintenance at Vandenberg AFB, and internal moves of personnel and related plant rearrangements.

	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	

b. Ground maintenance.. 1,292

This involves a direct 33 workyear effort, the provision of related supplies and equipment and reimbursement to the Air Force for the maintenance of NASA facilities at Cape Canaveral Air Force Station.

c. Facilities design engineering (27 workyears of effort) 791

This effort involves inspecting, siting, and other engineering functions associated with institutional facilities. Associated supply costs are also included.

d. Supplies and facilities equipment..... 500

Funds provide building materials, hardware, metals, plumbing supplies, electrical materials, and general maintenance and operating materials.

e. Routine facilities work. 768

Minor construction, repair and alteration projects are included in this activity. A level of effort of 15 workyears is provided by a support contract with off-site contractors being brought in when needed.

2. Equipment 617 632 553 603

Provides for 20 workyears of support contractor effort and related supplies required for maintenance and repair of heavy equipment items.

C. Custodial Services.. 7,412 9,133 7,576 10,299

The demand for these services will increase especially for janitorial, fire protection, and security services in 1979 as the Space Shuttle program nears the Orbital Flight Test. The increase involves 69 workyears of additional effort, and also reflects current support contractor wage rates.

1. Janitorial services (115 workyears) 2,479

This activity provides janitorial services to some 2.0 million square feet of KSC floor areas including highly specialized services to cleanroom areas. Involved is an increase of 6 workyears for STS operations and activation support.

		1978		1979
	1977	Budget	Current	Budget
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. Fire protection services (96 workyears)				3.077

This activity will provide for fire protection service for KSC property and personnel including:

- a. Supporting hazardous tests and operations and orbiter landings.
- b. Performing fire drills and fire inspections of facilities and equipment.
- c. Providing fire protection instructions.
- d. Fighting fires.

This estimate reflects the full activation of both the KSC fire stations including 18 additional work-years.

3. Security services (148 workyears)	3,760
--	-------

This activity includes the protection of personnel and property at KSC and involves:

- a. Supporting hazardous tests and operations.
- b. Badging of all on-site personnel and official visitors.
- c. Safeguarding flight hardware and other items of high intrinsic value.
- d. Protecting classified information.
- e. Maintaining area and traffic control.

This estimate reflects an additional 46 workyears.

4. Other related activities.	983
-----------------------------------	-----

These activities are as follows:

- a. Janitorial services and security services reimbursed to the Air Force Eastern Test Range for services performed on NASA facilities at Cape Canaveral Air Force Station.

- b. Pest control services for KSC which involves about 1 workyear of effort.
- c. Security services at Vandenberg Air Force Base, which requires 2 workyears of effort. This reflects a reduction of 1 workyear from the 1978 level.
- d. Laundry services at both KSC and Vandenberg Air Force Base.
- e. Provision of supplies and equipment related to custodial services.

	1977	1978		1979
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
D. <u>Utilities Services</u>	<u>8,383</u>	<u>8,883</u>	<u>8,647</u>	<u>9,651</u>

The major utility service at KSC is electrical energy purchased from the Florida Power and Light Company through an Air Force contract. Fuel oil is purchased from a local supplier. Steam service is provided by the Air Force at Cape Canaveral Air Force Station (ETR). Water services are purchased from the City of Cocoa and sewage treatment is accomplished on-site.

At Vandenberg Air Force Base, utility services are purchased through the U.S. Air Force.

Utility plant operations and maintenance and utility distribution systems maintenance are provided in this activity which also covers reimbursement to the Air Force at ETR and Vandenberg Air Force Base for these services. These services total \$1,983,000 for KSC and \$221,000 at ETR and Vandenberg AFB, a total of \$2,204,000. In addition, the commodity costs are as follows:

1. Electricity (205,000 MW/Hrs.)	6,120
2. Fuel oil (2,185,000 gals.)	880
3. Steam (47,800 K lbs.)	236
4. Water and sewage... ..	80
5. Vandenberg AFB - All utilities	131

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u>	<u>6.015</u>	<u>5.564</u>	<u>6.195</u>	<u>6.182</u>
-------------------------------------	--------------	--------------	--------------	--------------

	1977 Actual	1978 Budget Estimate Current Estimate (Thousands of Dollars)		1979 Budget Estimate
<u>Basis of Fund Requirement</u>				
A. <u>Automatic Data Processing</u>				
1. Equipment	404	261	246	509 ³
2. Operations	<u>2,737</u>	2,760	<u>3,365</u>	2,758
Subtotal	<u>3,141</u>	<u>3,021</u>	<u>3,611</u>	3,267 ⁷
B. <u>Scientific and Technical Information</u>				
1. Library	298	307	310	327
2. Education and information	<u>1,531</u>	<u>1,366</u>	<u>1,659</u>	1,750
Subtotal	<u>1,829</u>	<u>1,673</u>	<u>1,969</u>	2,077 ⁷
C. <u>Shop Support and Services</u>	<u>1,045</u>	<u>870</u>	<u>615</u>	—838 ⁸
Total, Technical Services	6,015	5,564	6,195	6,182 ²
A. <u>Automatic Data Processing</u>	<u>3,141</u>	<u>3,021</u>	<u>3,611</u>	3,267 ⁷

These funds provide for the cost of general management ADP programs including the lease, purchase, and maintenance of ADP equipment and programming and operations services.

1. Equipment	404	261	246	509
--------------------	-----	-----	-----	-----

The funding provides for the maintenance and lease of the Honeywell 635 and supporting equipment. The increase in 1979 is due to the planned purchase of an offline input/output processor.

2. Operations	2,737	2,760	3,365	2,758
---------------------	-------	-------	-------	-------

Ninety-four support contractor workyears provide programming and operations services for payroll, general accounting, supply reports, procurement, contract reports, technical support information retrieval (failure analysis), preventive maintenance reports of control vehicle components and ground support equipment,

contract surveillance status reports for the KSC Personnel Office, security reports, and resources and financial management reports. Twenty eight workyears of support contractor effort are required to perform keypunch services. The decrease in 1979 is due to a decrease of 34 workyears offset by negotiated support contractor wage rate increases.

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1979 <u>Budget Estimate</u>
B. <u>Scientific and Technical Information</u>	<u>1,829</u>	<u>1,673</u>	<u>1,969</u>	<u>2,077</u>

The funding provides for operation of a technical library at KSC and for various technical and administrative documentation services throughout the Center, including support to public affairs' educational and information program. The increase in 1979 reflects the previously negotiated support contractor wage rate increases.

1. Library	298	307	310	327
------------------	-----	-----	-----	-----

Thirteen support contract workyears are required to operate the KSC library facilities. The cost includes technical reports and literature in hard copy and microfiche; scientific technical, and management books and periodicals; military, federal, and professional society specifications and standards are also included. The contractor also operates a Shuttle/Spacelab documents repository which catalogs, classifies, and indexes documents for storage and retrieval; and provides document reference and distribution services. This category also includes supplies used by the contractor.

2. Education and information... ..	1,531	1,366	1,659	1,750
------------------------------------	-------	-------	-------	-------

The funding provides for 57 support contractor workyears to prepare publications pertaining to the receipt, checkout, and launch of space vehicles; Shuttle/Spacelab activities, design engineering functions, and institutional support. Subject matter covers tracking, facilities modifications, booster recovery, earth resources, future programs, launch processing, vehicle tests checkout operations, safety procedures, materials analysis, radiological controls, and contingency plans.

Public affairs support provides for the gathering and dissemination of information about the agency's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary levels. It also includes photographic support at Vandenberg Air Force Base, which is primarily for public affairs activities.

	1977 <u>Actual</u>	<u>1978</u>		1979 <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
C. <u>Shop Support and Services</u>	<u>1,045</u>	<u>870</u>	<u>615</u>	<u>838</u>

The funds provide for two support contracts, one at Vandenberg Air Force Base, to perform technical support services such as exercising coordinative control of support activities to assure a constant state of readiness to support test/launch operations. Disaster and hurricane planning is performed on a Centerwide basis through coordination with the KSC Emergency Preparedness Officer (seven workyears); trains all KSC personnel engaged in hazardous occupations (three workyears); and provides a wide variety of shop services, primarily fabrication of non-integral institutional equipment used throughout Center facilities (20 workyears). The increase in 1979 is the net of previously negotiated contractor wage rates, and the need to provide a full year funding in 1979, partially offset by a small decrease in effort.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>15,214</u>	<u>15,286</u>	<u>14,367</u>	<u>15,300</u>
---	---------------	---------------	---------------	---------------

Basis of Fund Requirements

A. Administrative Communications	2,020	2,111	2,202	2,351
B. Printing and Reproduction	3,059	2,978	3,084	3,246
C. Transportation	2,821	2,709	3,133	2,941
D. Installation Common Services	<u>7,314</u>	<u>7,488</u>	<u>5,948</u>	<u>6,762</u>
Total, Management and Operations	<u>15,214</u>	<u>15,286</u>	<u>14,367</u>	<u>15,300</u>

A. <u>Administrative Communications</u>	<u>2,020</u>	<u>2,111</u>	<u>2,202</u>	2,351
---	--------------	--------------	--------------	-------

Funds provide for the costs of local telephone service, Federal Telecommunications Systems (FTS), postage, long distance tolls, and teletype services in support of all NASA personnel, contractor and civil service, located on the Kennedy Space Center, the Eastern Test Range and Vandenberg Air Force Base. The increase in 1979 is due to the full year effect of 1978 rate increases.

a.

	<u>1977</u> <u>Actual</u>	<u>1978</u> <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		<u>1979</u> <u>Budget</u> <u>Estimate</u>
1. Local telephone service.				1,515
Provides for the total KSC population, including contractors, and includes the administrative telephone switchboard, single line telephones for special areas, telephones accoustically coupled for data transmission, and local foreign exchange lines for Brevard and Orange County locations.				
2. Long distance telephone service.....				641
NASA contractors and other institutions who conduct official business with KSC are widely dispersed throughout the United States. KSC utilizes FTS and other leased lines to minimize costs. Service is provided to authorized users, including on-site contractors. Paid long distance and GSA leased lines are in this category.				
3. Non-telephone communications.				195
Provides specialized services such as teletype and wire news services and official mail service. In addition, the lease and maintenance of various small electrical/electronic systems such as printers which support major communication systems are included.				
B. <u>Printing and Reproduction</u>	<u>3.059</u>	<u>2.978</u>	<u>3.084</u>	<u>3.246</u>
Includes the printing of test and checkout procedures, launch countdowns, microfilming, engineering drawings, telemetry data, and other related technical material. The increase in 1979 is due to a negotiated support contractor wage increase; contractor workyears are level.				
The estimate for administrative printing includes long lead time items such as forms production and minor efforts, such as the KSC house organ, and miscellaneous special requirements for duplicating, photostating, blueprinting, microfilming, and other photographic reproductions. Services are performed by other government agencies or by commercial printing firms.				
1. Scientific and technical printing				2,362
Seventy one workyears of support contractor effort are required to print or reproduce an average of 6.7 million units per month. Supplies used by the contractor and replacement equipment are included in this category .				

RPM 2

	1977 <u>Actual</u>	1978		1979 Budget Estimate
		<u>Budget</u> <u>Estimate</u> (Thousands	<u>Current</u> <u>Estimate</u> of Dollars)	

2. Administrative printing 244

This estimate includes the cost of services provided by the Government Printing Office, the Air Force Eastern Test Range, and Vandenberg Air Force Base.

3. Office copiers 640

Provides office copier service to the total on-site population, civil service and contractor. Copiers are located in central service centers and individual offices where workload justifies assignment. This arrangement has proven to be an economical way of providing this service.

C. Transportation 2,821 2,709 3,133 2,941

The Center provides a centralized motor pool, operated by GSA, for civil service and support contractor personnel. The movement of supplies and equipment by commercial carrier are included in this area. This category also includes the operation of heavy equipment, and related supplies and materials, and aircraft operations. The reduction in 1979 is the result of a revision to the KSC vehicle support plan, partially offset by a negotiated support contractor wage increase.

1. Truck rental 1,163

Provides for **430** cargo-type vehicles, a reduction of **245** vehicles from 1978. At Vandenberg Air Force Base, the support contractor provides dispatch services for the motor pool (one workyear).

2. Common carrier and related services..... 1,311

Twenty two support contractor workyears are required to perform the transportation management functions, which include coordination, check, inspection and document control of all shipments and delivery of in-bound shipments. Commercial transportation in 1979 reflects the continuing impact of Shuttle buildup. The balance of this requirement is supplies used by the support contractor, minor contracts for off-site packing and crating services, landing fees, maintenance and repair, and supplies and equipment associated with the administrative aircraft.

1977 <u>Actual</u>	1978		1979
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)			

3. Heavy equipment..... 467

Twelve workyears of support contract effort are required to operate KSC owned heavy equipment, such as tractors, cranes, trailers, and trucks. The balance is for replacement equipment and supplies.

D. Installation Common Services..... 7,314 7,488 5,948 6,762

The funds provide for logistics services, mail and distribution services, medical services, Center management and staff activities, and a wide variety of minor contracts for special and one-time services. The increase in 1979 is due to negotiated support contractor wage rate increase, and the need to provide a full year's funding in 1979, partially offset by a small reduction in effort.

1. Center management and staff functions..... 77

This category includes tort claims, notary public fees, court reporting costs, patent counsel representation and equal opportunity activities.

2. Medical services.. 1,427

Two major types of medical service are provided, occupational medicine and environmental health.

a. Occupational medicine 1,112

Forty one workyears of support contractor effort are required to provide emergency and first aid care for the KSC workforce, guests, and tour visitors; health maintenance and counseling for civil service employees; and a variety of physical examinations and special programs for health maintenance, applied research, and job certification. The contractor has also been charged with Occupational Safety and Health Administration standards compliance for all KSC elements. The medical program operates on a two-shift basis to provide emergency and ambulance services and special standby service in support of hazardous tests and operations. This category also covers supplies and equipment used by the contractor and a minor contract at Vandenberg AFB, primarily for physical examinations at that location.

	1978		1979
1977	Budget	Current	Budget
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
	(Thousands of Dollars)		

b. Environmental health.....~	315
-------------------------------	-----

Includes industrial hygiene, radiological health, and environmental sanitation requiring 11 work-years of support contractor effort. This includes water supply and distribution, sewage treatment and disposal, treatment and disposal of industrial wastes, solid waste management and disposal, selection and use of pesticides, and the surveillance of operations producing atmospheric, water, or soil pollution.

3. Installation support services.....	5,258
---------------------------------------	-------

a. Supply services.....	3,144
-------------------------	-------

These funds provide 111 support contractor workyears needed to provide a broad range of logistics services including receipt, storage, and issue of supplies and equipment, as well as maintaining various management systems, such as repair, modification, and ordnance.

b. Mail.....	539
--------------	-----

Mail and distribution services of 31 workyears, provided by a support contractor, include distribution of inter-office mail, classified document control and operation of the KSC branch post office.

c. Office supplies,.....	951
--------------------------	-----

As an economy measure, KSC provides common support to the total population, civil service and contractor. This category includes a wide variety of office supplies and materials.

d. Administrative equipment.....	624
----------------------------------	-----

This category covers lease, maintenance, and purchase of administrative equipment. Rentals are primarily special purpose office equipment more economical to lease than purchase, maintenance is provided for all government-owned administrative equipment in active service, and purchases are largely replacements of office machines such as typewriters and calculators.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER

STAFFING SUMMARY			
	FY78	FY79	
Excepted	76	74	
GS-16	4	4	
GS-15	115	115	
GS-14	700	700	
All other GS	1760	1789	
WIC	1	4	
TOTAL PERMANENT	2186	2207	

CENTER DIRECTOR			
	FY78	FY79	
Excepted	2	2	
GS-16	-	-	
GS-15	-	-	
GS-14	-	-	
All other GS	2	2	
TOTAL PERMANENT	4	4	

PUBLIC AFFAIRS OFFICE			
	FY78	FY79	
Excepted	-	-	
GS-16	-	-	
GS-15	1	1	
GS-14	2	2	
All other GS	18	18	
TOTAL PERMANENT	21	21	

CHIEF COUNSEL			
	FY78	FY79	
Excepted	1	1	
GS-16	-	-	
GS-15	-	-	
GS-14	1	1	
All other GS	6	6	
TOTAL PERMANENT	8	8	

EXECUTIVE STAFF			
	FY78	FY79	
Excepted	-	-	
GS-16	-	-	
GS-15	1	1	
GS-14	-	-	
All other GS	4	4	
TOTAL PERMANENT	5	5	

EQUAL OPPORTUNITY PROGRAM OFFICE			
	FY78	FY79	
Excepted	-	-	
GS-16	-	-	
GS-15	-	-	
GS-14	1	1	
All other GS	4	4	
TOTAL PERMANENT	5	5	

BIOMEDICAL OFFICE			
	FY78	FY79	
Excepted	-	-	
GS-16	-	-	
GS-15	1	1	
GS-14	1	2	
All other GS	9	10	
TOTAL PERMANENT	11	13	

MANAGER, SHUTTLE PROJECTS OFFICE			
	FY78	FY79	
Excepted	2	2	
GS-16	1	1	
GS-15	10	10	
GS-14	44	44	
All other GS	26	27	
TOTAL PERMANENT	133	138	

SCIENCES, TECHNOLOGY, & APPLICATIONS OFFICE			
	FY78	FY79	
Excepted	-	-	
GS-16	-	-	
GS-15	1	1	
GS-14	2	2	
All other GS	12	13	
TOTAL PERMANENT	15	16	

SAFETY, RQA, AND PROTECTIVE SERVICES			
	FY78	FY79	
Excepted	1	1	
GS-16	-	-	
GS-15	1	1	
GS-14	6	6	
All other GS	22	22	
TOTAL PERMANENT	29	30	

DIRECTOR OF SPACE VEHICLE OPERATIONS			
	FY78	FY79	
Excepted	2	2	
GS-16	-	-	
GS-15	5	5	
GS-14	4	5	
All other GS	77	80	
TOTAL PERMANENT	88	92	

DIRECTOR OF DESIGN/ENGINEERING			
	FY78	FY79	
Excepted	2	2	
GS-16	-	-	
GS-15	4	4	
GS-14	5	5	
All other GS	24	24	
TOTAL PERMANENT	31	31	

DIRECTOR OF TECHNICAL SUPPORT			
	FY78	FY79	
Excepted	2	2	
GS-16	-	-	
GS-15	3	3	
GS-14	11	12	
All other GS	36	35	
TOTAL PERMANENT	52	52	

DIRECTOR OF ADMINISTRATION AND MANAGEMENT OPERATIONS			
	FY78	FY79	
Excepted	1	1	
GS-16	-	-	
GS-15	-	-	
GS-14	-	-	
All other GS	4	4	
TOTAL PERMANENT	5	5	

DIRECTOR, STS PROCESSING			
	FY78	FY79	
Excepted	-	-	
GS-16	-	-	
GS-15	11	11	
GS-14	16	19	
All other GS	70	80	
TOTAL PERMANENT	97	110	

DIRECTOR, SHUTTLE ENGINEERING			
	FY78	FY79	
Excepted	2	2	
GS-16	-	-	
GS-15	18	19	
GS-14	24	24	
All other GS	173	169	
TOTAL PERMANENT	220	215	

DIRECTOR, PROJECT MANAGEMENT			
	FY78	FY79	
Excepted	1	1	
GS-16	-	-	
GS-15	-	-	
GS-14	4	4	
All other GS	58	57	
TOTAL PERMANENT	63	62	

DIRECTOR, SHUTTLE PAYLOADS			
	FY78	FY79	
Excepted	2	2	
GS-16	-	-	
GS-15	9	9	
GS-14	13	13	
All other GS	63	69	
TOTAL PERMANENT	87	93	

DIRECTOR, EXPENDABLE VEHICLES			
	FY78	FY79	
Excepted	1	1	
GS-16	-	-	
GS-15	6	5	
GS-14	13	10	
All other GS	96	79	
TOTAL PERMANENT	116	95	

DIRECTOR, MECHANICAL AND FACILITIES ENGINEERING			
	FY78	FY79	
Excepted	1	1	
GS-16	-	-	
GS-15	1	1	
GS-14	7	6	
All other GS	18	16	
TOTAL PERMANENT	27	24	

DIRECTOR, ELECTRONIC ENGINEERING			
	FY78	FY79	
Excepted	1	1	
GS-16	1	1	
GS-15	5	5	
GS-14	10	9	
All other GS	117	109	
TOTAL PERMANENT	134	125	

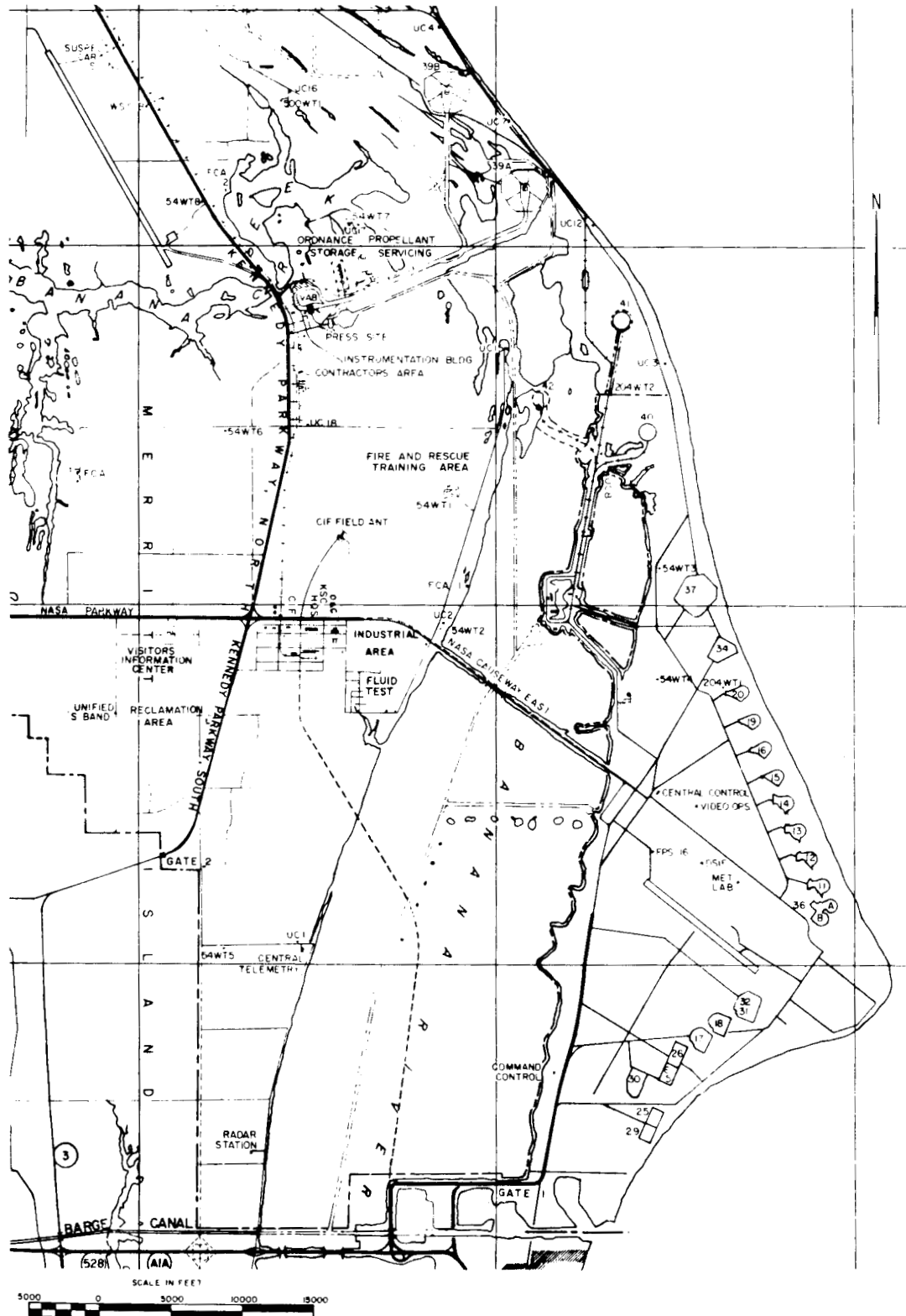
DIRECTOR, INFORMATION SYSTEMS			
	FY78	FY79	
Excepted	1	1	
GS-16	1	1	
GS-15	7	4	
GS-14	32	33	
All other GS	216	215	
TOTAL PERMANENT	257	254	

DIRECTOR, SUPPORT OPERATIONS			
	FY78	FY79	
Excepted	1	1	
GS-16	1	1	
GS-15	7	4	
GS-14	19	19	
All other GS	187	192	
TOTAL PERMANENT	215	216	

DIRECTOR, ADMINISTRATIVE OPERATIONS & SUPPORT SERVICES			
	FY78	FY79	
Excepted	1	1	
GS-16	-	-	
GS-15	4	4	
GS-14	17	17	
All other GS	169	169	
TOTAL PERMANENT	191	191	

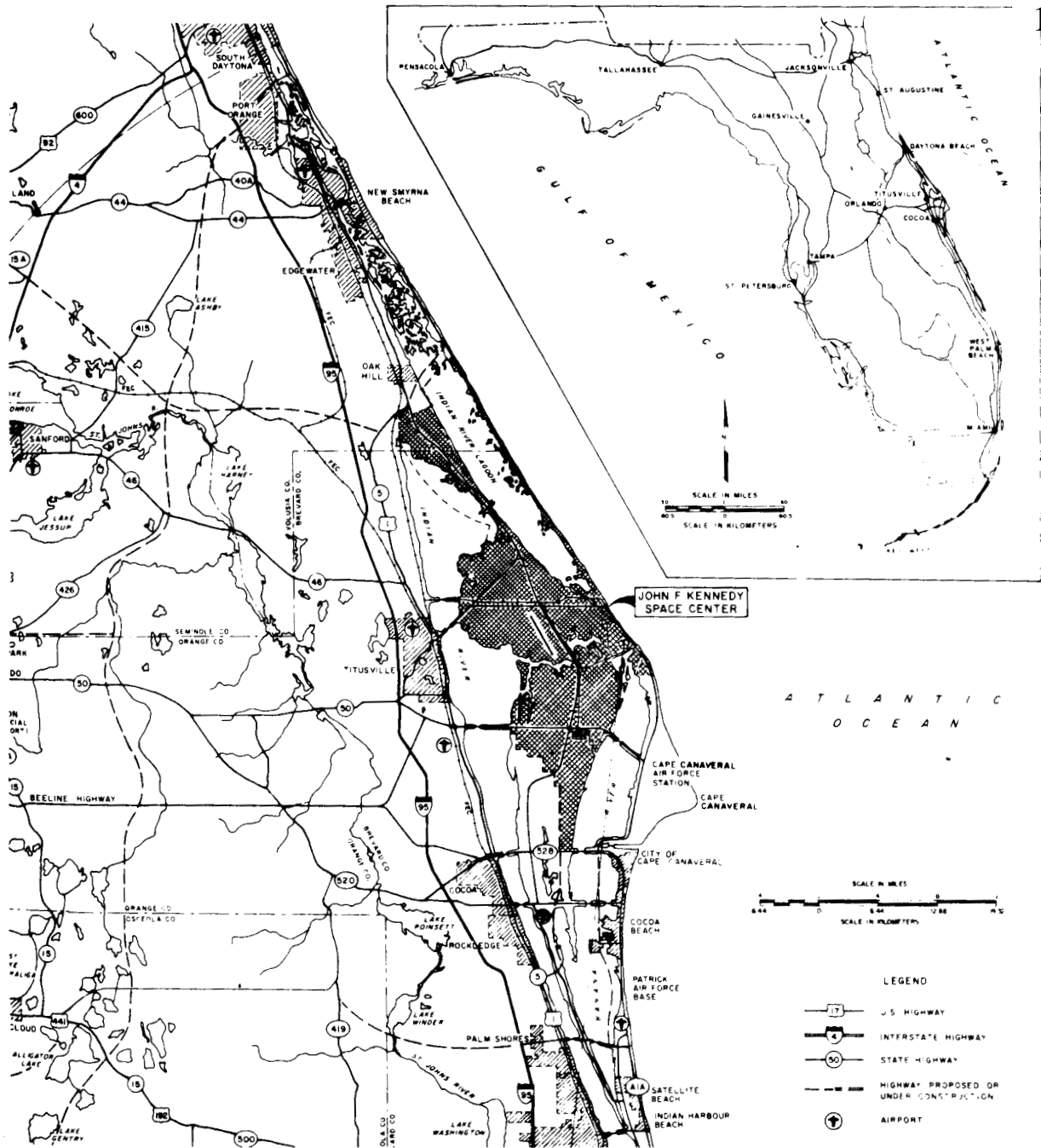
DIRECTOR, PROCUREMENT, SUPPLY, & TRANSPORTATION			
	FY78	FY79	
Excepted	2	2	
GS-16	-	-	
GS-15	6	5	
GS-14	12	12	
All other GS	171	171	
WIC	4	4	
TOTAL PERMANENT	195	194	

JOHN F. KENNEDY SPACE CENTER, NASA FISCAL YEAR 1979 ESTIMATES LOCATION PLAN

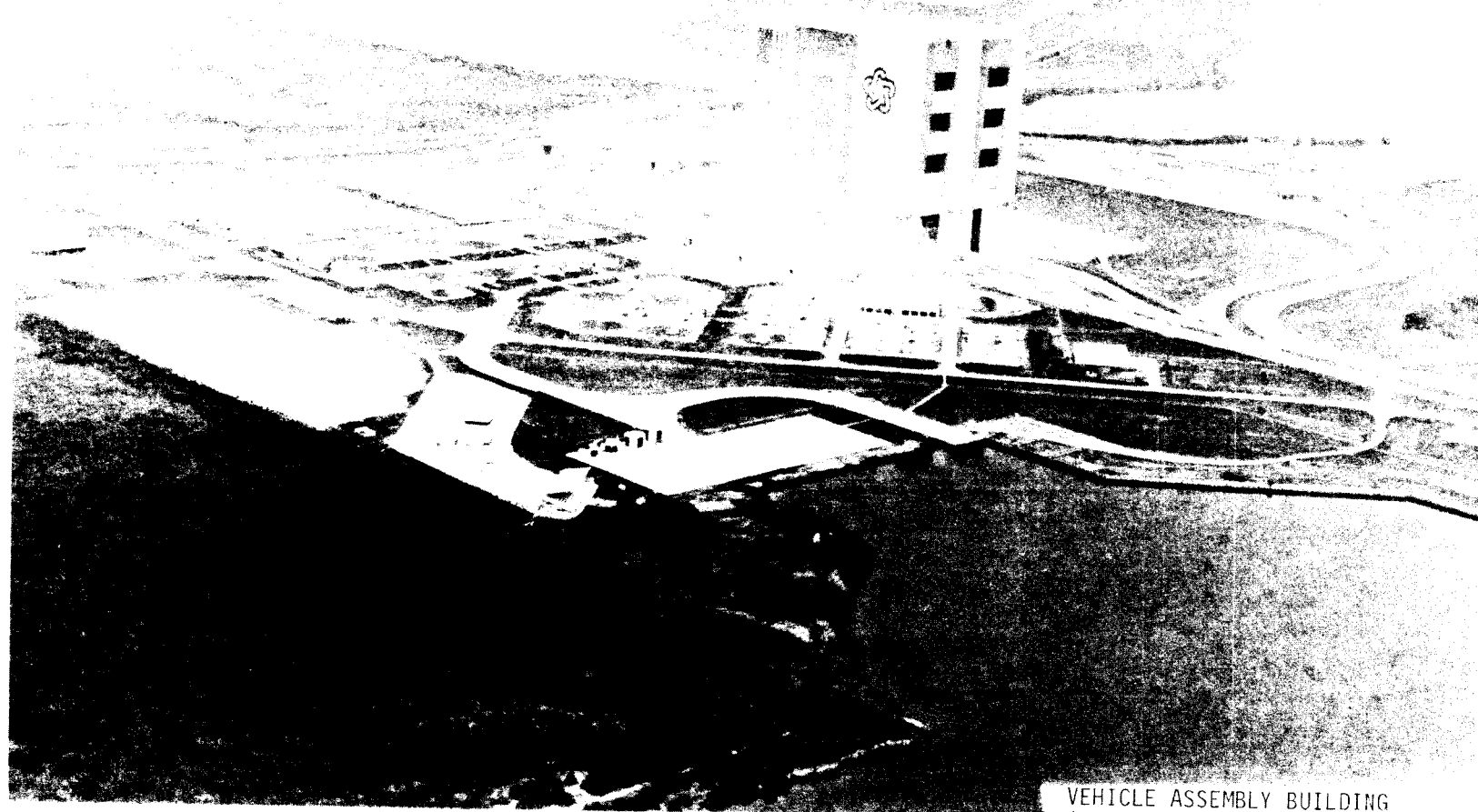


JOHN F. KENNEDY SPACE CENTER, NASA FISCAL YEAR 1979 ESTIMATES AREA MAP

RPM 2-27

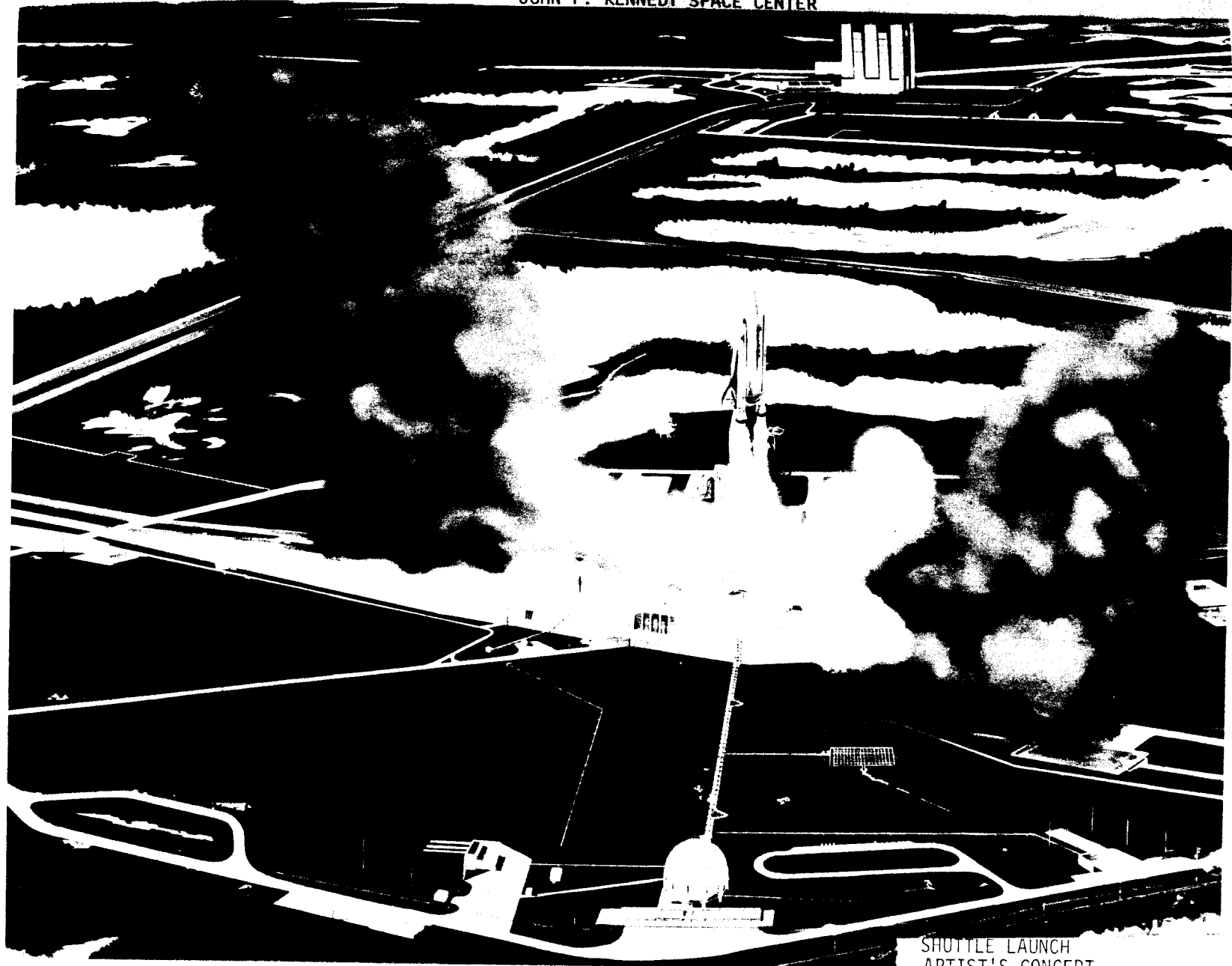


JOHN F. KENNEDY SPACE CENTER



VEHICLE ASSEMBLY BUILDING
(SHUTTLE RUNWAY IN BACKGROUND)
RPM 2-28

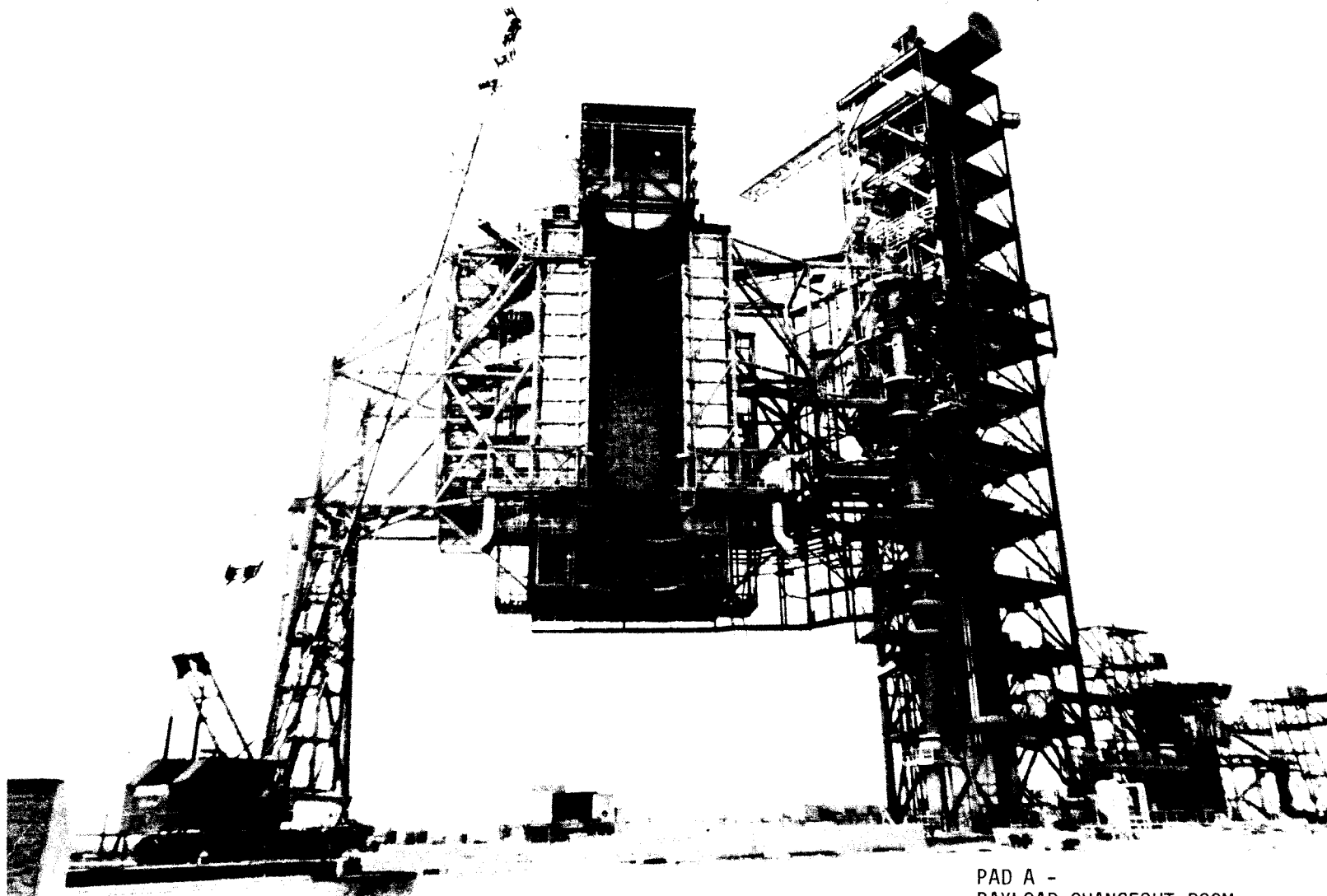
JOHN F. KENNEDY SPACE CENTER



SHUTTLE LAUNCH
ARTIST'S CONCEPT

RPM 1-29

JOHN F. KENNEDY SPACE CENTER



PAD A -
PAYLOAD CHANGEOUT ROOM

RPM 2-30

JOHN F. KENNEDY SPACE CENTER



INDUSTRIAL AREA
RPM 2-31

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

GEORGE C. MARSHALL SPACE FLIGHT CENTER

DESCRIPTION

Operations at the Marshall Space Flight Center (MSFC) are conducted at three primary locations:

The principal MSFC site is near Huntsville, Alabama, on Army property at the Redstone Arsenal. The Center occupies 1,840 acres under a nonrevocable use permit from the Army. The Huntsville location is connected by deepwater access to its component Michoud Assembly Facility via the Tennessee, Ohio, and Mississippi Rivers. Certain facilities such as the Redstone Arsenal Air Field and some utilities are used jointly by NASA and the Army. The capital investment of the Marshall Space Flight Center and contractor-held facilities at various locations as of September 30, 1977, was \$568,556,000.

The Michoud Assembly Facility, located 15 miles east of New Orleans, Louisiana, is where the External Tank for the Space Shuttle is being produced, and where activities for other Federal agencies are conducted. The Michoud Facility occupies 891 acres and provides 3,556,550 square feet of space, including the main assembly plant which has an area of 43 acres under one roof. The facility is located on the Gulf Intracoastal Waterway and has deepwater access via the Mississippi River. The capital investment as of September 30, 1977, was \$132,927,000.

The Slidell Computer Complex, located at Slidell, Louisiana, 20 miles northeast of the Michoud Assembly Facility, occupies 14 acres and provides centralized computer services for MSFC, Michoud, National Space Technology Laboratories, other NASA centers, associated contractors, and other Government agencies as designated. The Slidell capital investment as of September 30, 1977, was \$18,494,000.

A number of the individual facilities at MSFC and its component installations are unique within NASA, the Nation, and the free world. The combined capability of the science and engineering laboratories, special development facilities, and test facilities, provide a unique national resource for the design, development, and test of complex space systems. The total capital investment of the Marshall Space Flight Center and its installations in Louisiana, including fixed assets in progress, and contractor-held facilities at various locations as of September 30, 1977, was \$719,977,000.

CENTER ROLES AND MISSIONS

The Marshall Space Flight Center serves as one of NASA's primary centers for the design and development of space transportation systems, orbital systems, scientific and applications payloads, and other systems for present and future space exploration. MSFC is the principal center within NASA for rocket propulsion systems; for the design and development of assigned manned vehicle systems; for Spacelab mission management and payload definition; for design and development of assigned large, complex and specialized automated spacecraft; and development of capability for space processing activity. MSFC is a primary center within NASA for the development and processing of science and applications experiments and for the conduct of energy-related system studies. In addition, MSFC conducts a vigorous research and technology program and is deeply involved in the study and definition of future programs, including significant roles contributing to the development of large, complex space structures, space propulsion systems, materials engineering, materials processing in space, power systems, guidance and control, fundamental electronics, and payload systems analysis and integration.

In addition to onsite activities at Huntsville, Alabama, MSFC manages the Michoud Assembly Facility at New Orleans and the Computer Complex at Slidell, Louisiana. Resident offices are maintained at other centers and in conjunction with major industrial sites in various locations throughout the Nation, and in Europe for the Spacelab program. The principal and supporting roles are:

PRINCIPAL

Propulsion Systems - design, development and procurement of major propulsion-oriented systems and subsystems. Current focus is on Shuttle-related systems, including Shuttle main engine, solid rocket booster, external tank, and interim upper stage in cooperation with the Air Force. Advanced program effort includes the solar electric propulsion systems, the heavy lift launch vehicle, and the orbital transfer vehicle.

Manned Space Vehicle Development - design, development and procurement of manned vehicle systems as assigned by Headquarters.

Spacelab - focus is on systems engineering management, development interface with European Space Agency and procurement.

Advanced Studies - focus is on orbital systems and advanced transportation systems.

Advanced Development - technology advances focused on advanced missions identified above within those disciplines assigned.

Space Transportation System (STS) Sustaining Engineering - providing sustaining engineering for Headquarters assigned STS hardware.

Spacelab Mission Management and Payload Definition - management of Spacelab I and II missions and definition of requirements for and development of an Atmospheric Cloud Physics Laboratory for flight as a partial payload of the Spacelab.

Specialized Automated Spacecraft - design and development of large, complex and/or specialized automated spacecraft as assigned. Current focus is on spacecraft and systems and experiment integration for Space Telescope, High Energy Astronomy Observatory, and Gravity Probe B spacecraft development.

Space Processing - developing space processing discipline base, developing and managing space processing experiments for Spacelab.

Data Management - development of applications-oriented data management discipline base. Contributing overall data management systems expertise in support of advanced high data rate systems development.

SUPPORTING

Space Vehicle Structures and Materials - contributing to the development of large, complex space vehicle structures and materials technology base.

Energy Technology and Applications - conducting energy-related system studies for reimbursable activity with primary focus on solar heating and cooling and advanced coal extraction technology.

Satellite Power System - conducting definition activity roles.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1977 Actual	1978 Budget, <u>Estimate</u> (Thousands of Dollars)	1978 Current <u>Estimate</u>	1979 Budget <u>Estimate</u>
I. Personnel and Related Costs.....	110,751	108,187	115,758	114,413
11. Travel.....	2,141	2,291	2,216	2,382
III. Facilities Services.....	19,436	11,016	10,488	10,598
IV. Technical Services.....	7,707	6,728	6,072	6,418
V. Management and Operations.....	7,382	<u>6,471</u>	<u>6,951</u>	<u>7,046</u>
Total, fund requirements.....	<u>139,417</u>	<u>134,693</u>	<u>141,485</u>	<u>140,857</u>

Distribution of Permanent Positions by Program

Direct Positions

<u>Space Transportation Systems</u>	2,390	<u>2,314</u>	<u>2,153</u>	<u>2,045</u>
Space shuttle... ..	1,556	1,403	1,371	1,125
Space flight operations.....	834	911	782	920
<u>Space Sciences</u>	<u>437</u>	451	498	558
Physics and astronomy,	437	451	498	558

	1977 Actual	1978 Budget Estimate	1978 Current Estimate	1979 Budget Estimate
<u>Space and Terrestrial Applications.....</u>	<u>200</u>	<u>228</u>	<u>223</u>	<u>281</u>
Space applications.....	191	216	212	271
Technology utilization... ..	9	12	11	10
<u>Aeronautics and Space Technology.....</u>	<u>237</u>	<u>264</u>	<u>243</u>	<u>213</u>
Aeronautical research and technology.....	10	13	10	8
Space research and technology.....	68	61	81	86
Energy technology applications.....	<u>159</u>	<u>190</u>	<u>152</u>	<u>119</u>
Subtotal, direct positions.....	3,264	3,257	3,117	3,097
<u>Center Management and Operations Support Positions..</u>	<u>646</u>	<u>653</u>	<u>643</u>	<u>618</u>
Total, permanent positions.....	<u>3,910</u>	<u>3,910</u>	<u>3,760</u>	<u>3,715</u>

PROGRAM DESCRIPTION

SPACE SHUTTLE

1,125 Permanent Positions (Civil Service).

The major MSFC Shuttle element assignments consist of: (1) the Space Shuttle Main Engine (SSME); (2) the Solid Rocket Booster (SRB); (3) the External Tank (ET); (4) planning, preparation and conduct of major Shuttle systems tests (i.e., structural, ground vibration, propulsion, launch acoustical environment); and (5) Shuttle system level analysis, test and integration tasks such as: ascent control and stability analysis; flight performance analysis and predictions; aerothermodynamic and acoustic analysis and flight predictions; structural dynamic analysis and modeling; systems safety and risk analysis; and test, checkout and launch criteria requirements.

PROGRAM DESCRIPTION

Space Shuttle Main Engine

The engine system level testing will continue at the National Space Technology Laboratories (NSTL) leading to a preliminary flight certification in 1979. The testing will continue through 1979 to provide final flight certification in 1980 and to demonstrate the engine flight life. The first flight set of three engines for use in Orbital Flight Test and a backup engine will be delivered in early 1979. The Control Simulation Laboratory in the Systems Dynamics Laboratory will continue in operation to assist in flight planning and to investigate system failure modes and anomalies which may occur during Orbital Flight Tests (OFT). Engine refurbishment requirements will be finalized and the overhaul of the three engines used in Main Propulsion Test will be initiated at the end of 1979.

Solid Rocket Booster

The first qualification firing of the SRM is scheduled early in FY 1979 and the qualification test firing program will be completed prior to the First Manned Orbital Flight (FMOF) in 1979. The SRB structural test program at MSFC will all be completed prior to FMOF with the exception of the recovery loads test which is scheduled for completion shortly thereafter. The first three SRB flight sets will be delivered in 1979. Significant effort will be required in 1979 to provide this flight hardware, evaluate hardware performance for the first three OFT flights, and in verifying refurbishment design and procedures to assure meeting the design reuse goals. In-house sustaining engineering, configuration management, interface control documentation, logistics and ground operations will continue to be significant efforts in 1979.

External Tank

The highly complex External Tank (ET) structural test program will be completed in 1979 and the initial units will be delivered to KSC for Orbital Flight Test program. Since the ET is an expendable unit, it is a significant element in the Shuttle recurring cost per flight, and continuing management challenges will be presented to reduce unit cost. In 1979 launch support, flight analysis, and continuing production and vendor support as well as redesign effort in areas such as thermal protection systems, simplification, and weight reduction will be carried on.

Major Shuttle Tests

The Main Propulsion Test will be conducted by the Space Division of Rockwell International, under the technical direction of MSFC, at NSTL starting in 1978. The actual test program will be completed early in 1979, but the test facility/capability will be maintained through 1979 to provide backup support to resolve problems which may occur during the Orbital Flight Test program.

The Mated Vertical Ground Vibration Test will be conducted at MSFC in the modified Saturn V dynamics test facility starting in 1978. The test program will be completed in 1979 and the necessary analyses will be completed prior to the First Manned Orbital Flight.

Shuttle System Engineering

In 1979, Shuttle system engineering tasks will continue in support of the Shuttle development program, flight performance predictions will be completed, operational limits will be established, and flight performance evaluation will be made for the Orbital Flight Test program. Test, checkout and launch criteria requirements and specifications for use at KSC will be baselined. The planning for mission evaluation for the First Manned Orbital Flight and other Orbital Flight Test missions will be completed.

SPACE FLIGHT OPERATIONS

920 Permanent Positions (Civil Service)

The Space Flight Operations program includes Space Transportation System Operations Capability Development; Space Transportation System Operations; Development, Test and Mission Operations; and Advanced programs. The STS Operations Capability Development activity includes five major areas of effort: Spacelab, STS Upper Stages, Multimission and Payload Support Equipment, MCC Upgrading (level II), and Payload and Operations Support (Skylab Reboost/Deorbit). The Civil Service positions in 1979 are requested to carry out the following program milestones:

Space lab

In 1979, the Spacelab engineering model and flight unit will complete integration and test in Europe and be delivered to NASA where integration and operational flow process verification will begin. NASA funded hardware and software activity will also be continued. Manufacturing and testing of the Spacelab transfer tunnel and the verification flight instrumentation equipment will be completed and delivered by the end of the fiscal year. The software development facility will reach full operational capability and the experiment computer operating system will be nearing completion. OFT pallet upgrading, test, verification, and integration will be completed leading to launch on the second orbital flight test. Procurement of one additional Spacelab unit from the European Space Agency (ESA) will be initiated. End item specification evaluations and contract performance will be concluded for the core segment and the experiment segment (major items) during 1979, and will provide for a production start on the racks, pallets, and the viewport.

The 1979 Civil Service personnel level provides for continuation of system requirements and interface definition and control, NASA hardware and software development, and preparation for Spacelab ground and flight verification on a schedule consistent with the milestones for Spacelab operational capability development which includes the first two Spacelab flights. The objectives of these flights, scheduled for late 1980 and mid-1981, are to verify the Spacelab system and subsystems performance capabilities, verify Spacelab/Orbiter and Spacelab/experiment interface compatibility and to determine the Spacelab induced environment.

STS Upper Stages (Interim Upper Stage)

The Interim Upper Stage (IUS) is being developed by the U.S. Air Force (SAMSO) and will be operational in 1980. MSFC is responsible for the definition and control of the NASA and non-DOD requirements and for providing these to SAMSO for incorporation into the IUS system development contract. In addition, MSFC participating with SAMSO, will provide the management and technical evaluation of the IUS development contract's design, development and test efforts to assure that the NASA-unique and non-DOD user requirements are incorporated.

In 1979, the 25 percent engineering drawing release and the 50 percent drawing release for the NASA IUS twin stage plus spinner configuration will be accomplished. The NASA support of the IUS solid rocket motor development test firings will be completed in 1979. NASA support of the component qualification testing will be initiated in 1979. Production of the first NASA flight vehicles will continue in 1979.

STS Operations

The major activities in STS Operations in FY 1979 will involve procurement and technical management of Shuttle and Interim Upper Stage flight hardware and ground support items in preparation for STS operational flights commencing in 1980. The major effort will involve external tank and solid rocket booster hardware. Production will also be in progress on Interim Upper Stages.

Payload and Operations Support (Skylab Reboost/Deorbit-Teleoperator Retrieval System)

The Skylab Reboost/Deorbit activities will provide the capability to adjust the orbit of the Skylab with a teleoperator retrieval system during the orbital flight test program. The system is designed to either boost the Skylab to a higher orbit thereby extending its lifetime, or to guide reentry into a predetermined remote ocean area. The teleoperator retrieval system will be a low thrust maneuverable and reusable device remotely operated from the Shuttle through direct television and command link. After reboost/deorbit operations are completed, the teleoperator retrieval system will then return to the Space Shuttle with the aid of its own onboard guidance and computer systems. In 1979, Civil Service personnel will be used to accomplish overall management, technical surveillance and simulation verification of the system.

Advanced Programs

The Advanced programs effort at MSFC includes the definition and implementation of in-house and contracted system studies to establish the fundamental planning and decision making data needed prior to proposing future space programs. Major 1979 advanced studies activities include: completion of design studies for the tethered satellite system; completion of studies for a 25KW power module; continued concept studies of techniques for fabrication of structural elements in space; studies of improved propulsion systems capable of using different propellants in the same system; studies of long life highly reliable thermal control systems; and studies of advanced manipulator systems, remote controls, visual aids and sensory systems to augment the ability of humans to function efficiently in space.

PHYSICS AND ASTRONOMY

558 Permanent Positions (Civil Service)

The Center provides leadership in the Agency's Space Science program for the High Energy Astronomy Observatory (HEAO), Space Telescope, and Spacelab Payload Missions 1 and 2; and provides supporting research and technology support to identify the new technologies required for future missions.

High Energy Astronomy Observatory

The High Energy Astronomy Observatory (HEAO) program is a series of three, large, unmanned observatories developed under the direction of MSFC for performing scientific investigations in high energy astronomy. During 1979, the key milestones will be preparing for and conducting the launch of the HEAO-B Observatory, and integration and launch of the HEAO-C Observatory. Data reduction and analysis of HEAO-B data will be underway during this period.

Space Telescope

The objective of the Space Telescope project is to orbit a high optical quality 2.4-meter telescope system by the Space Shuttle in late CY 1983 for use by the astronomical community in conjunction with NASA. The 1979 level provides for continuation of refining design requirements, preliminary design of all systems, and evaluating the contractor's accomplishment of project objectives. During 1979, preliminary design reviews will be accomplished for all scientific instruments which will evaluate the basic engineering approach and preliminary systems design before commitment to detail design. Preliminary design reviews will be accomplished for the Optical Telescope Assembly and Support Systems Module in 1979. The European Space Agency (ESA) will continue the design and development of the Solar Array and Faint Object Camera during 1979.

Spacelab Payload Mission Management

MSFC is the lead center for the management and implementation of Spacelab Missions 1 and 2 payloads, which begins with the definition and recommendation of the payload complement and ends with the dissemination of flight/mission related data required for experiment analysis and processing. During 1979 MSFC will manage development of the experiment complements of Spacelab Missions 1 and 2. Supporting mission peculiar hardware and software, ground support equipment, and Level IV physical integration hardware and software will be designed, developed, procured, and tested during 1979 in preparation for the Level IV integration of the mission experiments in 1980. During 1979, interfaces will continue to be maintained with the NASA discipline program offices, the Principal Investigators, and appropriate engineering groups to assure that the scientific objectives of the missions are achieved. MSFC will participate in and manage the analysis of the requirements, objectives, characteristics, and constraints of several systems, subsystems, and hardware/software components of the STS, payload carrying equipment and payload components, so as to define and develop requirements for all levels of integration to insure physical, functional and operational compatibility.

Supporting Research and Technology

The supporting research and technology activities at MSFC are oriented to develop new technologies required for future science missions. The principal science areas are the Astrophysics and Solar Physics. In 1979 final definition study efforts for specific systems of an Advanced X-Ray Astrophysics Facility will be in process or initiated. Also, final definition study of the Stanford Relativity Satellite (GP-B) will be initiated.

SPACE APPLICATIONS

271 Permanent Positions (Civil Service)

The civil service complement requested for this line item will be involved in four major space applications assignments: (1) Spacelab Mission 3, (2) Atmospheric Cloud Physics Laboratory, (3) Materials Processing in Space, and (4) Future Space Transportation System (STS) Payload Definition.

Spacelab Mission 3

The Spacelab Mission 3 payload is dedicated to applications and science and will be the first use of a facility in space dedicated primarily to the user community. Significant events that will occur in 1979 include the finalization of integration requirements, and equipment procurements will be initiated for the integration complex for the physical integration of the scientific payload complement hardware, software, and supporting equipment with the appropriate payload carrier interfaces.

Atmospheric Cloud Physics Laboratory

The Atmospheric Cloud Physics Laboratory, under MSFC's management direction, will be flown in 1981 as a partial payload of Spacelab to provide the scientific community a unique multipurpose laboratory facility for conducting experimental atmospheric cloud physics research in a low-gravity environment. In 1979, laboratory design and development will continue through fabrication and developmental testing of the engineering unit. The critical design review for the ACPL flight unit and for each of three first flight experiments will be conducted and subsequently component acquisition and subsystem fabrication of the qualification unit will be initiated. A heavy load in project management activities to control and coordinate the major laboratory design and development effort as well as experiment development activities of seven separate principal investigators will be experienced in 1979. Systems engineering and integration will enter a critical phase to assure proper design, engineering, and scientific relationships among the areas of Spacelab-to-ACPL, experiment-to-ACPL, man-machine constraints, and overall performance capability.

Materials Processing in Space

The objective of the Materials Processing in Space program is to make use of the unique aspects of space, such as low gravity, to create materials better than those possible on Earth. In 1979, the Materials Processing in Space program at Marshall Space Flight Center will be proceeding in three major areas: Supporting Research and Technology (SR&T), the Space Processing Applications Rocket (SPAR) project, and the Shuttle/Spacelab Payloads program (MPS/SL). In addition to these areas, MSFC also directs activities in space processing to serve a diverse materials industry including electronics, metallurgy, pharmaceuticals, glass, and chemical processing. The feasibility of a Molecular Wake Shield (MWS) to provide both low gravity and ultra-high vacuum materials processing in Earth orbit is also being studied. All of these activities are continuing studies for which significant civil service effort will be expended during 1979.

Future Payload Definition

Civil service personnel in this area will be involved in identifying and defining payloads which can fully capitalize on the new and unique capabilities of the STS and conducting related supporting research and technology necessary to pave the way for these missions and payloads. The 1979 milestones include the detailed investigation of user requirements for missions in the 1982 time frame and beyond. These user requirements will be used to develop conceptual definitions of candidate projects and missions. Theoretical and experimental research will be done in the area of severe storms and local weather research. Efforts will be concentrated on the analysis of applications program disciplines (Communications, Weather and Climate, Earth Resources, etc.) to determine mission and payload requirements for future STS missions.

TECHNOLOGY UTILIZATION

10 Permanent Positions (Civil Service)

The Technology Utilization program transfers new knowledge and innovative technology resulting from NASA's R&D programs for application in industry, medicine, and public sectors areas. MSFC civil service engineering and science personnel provides the primary source of technical skills necessary to accomplish the technology transfer to the public sectors.

AERONAUTICAL RESEARCH AND TECHNOLOGY

3 Permanent Positions (Civil Service)

The Aeronautics Research and Technology effort is concerned with aircraft operations and safety. The major activities in 1973 will be to continue studies of turbulence over the span of an aircraft wing, to perform

gust correlations, to investigate the dissipation of fog, and to continue development of a Clear Air Turbulence detection (CAT) system. Field tests of the CAT detection system will be performed to provide verification data.

SPACE RESEARCH AND TECHNOLOGY

86 Permanent Positions (Civil Service)

The major Space Technology discipline efforts at Marshall are in materials, structures and dynamics, high density circuit technology, guidance and control, large solar array technology, fluid chemistry, magnetism and cryophysics and propulsion. In 1979, these efforts will focus on developing technology for high performance propulsion power systems and large space systems for the future.

Also included in this area is the Shuttle/Spacelab Payloads effort concerned primarily with the Induced Environmental Contamination Monitor (IECM), the Solar Electric Propulsion (SEP) Solar Array, Geophysical Fluid Flow and Tribological Experiments. All of these areas will have continuing emphasis throughout 1979.

ENERGY TECHNOLOGY APPLICATIONS

119 Permanent Positions (Civil Service)

Civil service manpower will be used for energy from space studies, development of a guidance and control system for coal extraction, and selected tasks for development in support of the National Program for Solar Heating and Cooling.

Energy from Space

Energy from space encompasses definition studies in two areas: satellite power systems and the nuclear energy waste management. Activities in 1979 will include the identification of system/subsystem requirements, development of conceptual designs and operational scenarios, development and impact of technology requirements, concept evaluations and selections and cost/economic estimate/model development.

Automated Coal Extraction

The Department of Energy has overall responsibility for developing an automated longwall shearer mining system which will improve productivity and enhance health and safety of the miners. MSFC is working with the Department of Energy to develop a guidance and control system to automate the longwall shearer system. Activities in 1979 will include program and contract management, design, fabrication, test of experimental sensors and controls, data evaluation and systems analysis.

Solar Heating and Cooling

As part of the National program for Solar Heating and Cooling, MSFC is managing selected tasks for development in support of the Solar Heating and Cooling Demonstration program, and a portion of the Commercial Demonstration program for the Department of Energy. These tasks will continue throughout 1979.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

618 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or services being provided to all Marshall Space Flight Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director, and immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Planning and Analysis, Public Affairs, Energy Management and Health and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Center-wide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1977 <u>Actual</u>	1978 Budget <u>Estimate</u>	1978 Current <u>Estimate</u>	1979 Budget <u>Estimate</u>
		(Thousands	of Dollars)	
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>110.751</u>	<u>108.187</u>	<u>115.758</u>	<u>114.413</u>

Basis of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Permanent positions.....	97,974	94,916	102,268	101,254
b. Nonpermanent.....	1,578	1,801	1,261	1,150
c. Reimbursable details.....	77	88	144	144
d. Overtime and other compensation.....	561	<u>567</u>	<u>755</u>	792
Subtotal, Compensation.....	100,190	97,372	104,428	103,340

2. <u>Benefits</u>	<u>10,007</u>	<u>10,297</u>	<u>10,946</u>	<u>10,702</u>
Subtotal, Compensation and Benefits.....	<u>110,197</u>	<u>107,669</u>	<u>115,374</u>	114,042

B. Supporting Costs

1. Transfer of personnel.....	247	196	246	196
2. Personnel training.....	<u>307</u>	<u>322</u>	<u>138</u>	<u>175</u>
Subtotal, Supporting Costs.....	554	518	<u>384</u>	<u>371</u>
Total, Personnel and Related Costs.....	<u>110,751</u>	<u>108.187</u>	<u>115.758</u>	<u>114.413</u>

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1979 <u>Budget</u> <u>Estimate</u>
A. <u>Compensation and Benefits</u>	<u>110,197</u>	<u>107,669</u>	<u>115,374</u>	<u>114,042</u>
1. <u>Compensation</u>	<u>100,190</u>	<u>97,372</u>	<u>104,428</u>	<u>103,340</u>
a. <u>Permanent positions</u>	<u>97,974</u>	<u>94,916</u>	<u>102,268</u>	<u>101,254</u>

The funds shown above will support 3,715 permanent positions in 1979. The increase in cost from the 1978 budget estimate to the 1978 current estimate is due to 1978 pay increases partially offset by a lower personnel level. The decrease in 1979 is due to further reductions in civil service permanent personnel levels, partially offset by within grade and career development increases.

Basis of Cost for Permanent Positions

In 1979 the cost of permanent positions will be \$101,254,000, a decrease of \$1,014,000 from 1978. This decrease is calculated as follows:

Cost of permanent positions in 1978.....	102,268
Cost Increase in 1979.....	+1,608
Within grade advances and career development:	
Full year effect of 1978 actions.....	+687
Partial year effect of 1979 actions.....	+609
Full year effect of 1978 pay increases....	+97
Decrease in reimbursable activity.....	+215
Cost Decrease in 1979	
Turnover Savings and abolished positions	-2,622
Full year effect of 1978 actions.....	-1,472
Partial year effect of 1979 actions.	-1,150
Cost of permanent positions in 1979.	<u>101,254</u>

	1977 <u>Actual</u>	<u>1978</u> Budget Current <u>Estimate</u> <u>Estimate</u>		1979 <u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
b. Nonpermanent positions				
1. cost.....	1,578	1,801	1,261	1,150
2. Workyears.....	219	250	168	151

The 1979 plan includes 151 workyears which will be used to support the following programs at the approximate levels shown below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training.....	54
Summer employment.....	25
Youth opportunity.....	47
Other temporary employment.....	<u>25</u>
Total	<u>151</u>

The nonpermanent personnel programs have been reduced from a level of 219 workyears in 1977 to the 151 workyears level shown above.

c. Reimbursable detailees.....	77	88	144	144
--------------------------------	----	----	------------	-----

Reimbursable detailees are assigned to NASA from W D to support the Center in the field of solid rocket motors and in the use of the Neutral Buoyancy Simulator. The simulator is used in the development of operational procedures and the evaluation of design concepts to assure flight hardware will function in space (effort supports development, design, instrumentation, and engineering techniques for Spacelab Transfer Tunnel, STS Power Module, Shuttle Payload Bay and Solar Array Systems). This effort provides mutual benefits to NASA and DOD by providing NASA with special talents and by keeping DOD personnel current on space flight technology. The 1979 effort is at the same level as 1978.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> of Dollars)	<u>Budget</u> <u>Estimate</u>
d. Overtime and other compensation	561	567	755	792

The increase in 1978 and 1979 reflects increased activity in the Shuttle Testing programs, and the effect of the October 1977 pay increase.

2. Benefits	<u>10,007</u>	<u>10,297</u>	<u>10,946</u>	<u>10,702</u>
-------------------	---------------	---------------	---------------	---------------

The distribution of these costs by major categories is as follows:

Category of Cost

Civil Service retirement fund	6,931	6,666	7,167	7,076
Employee life insurance... ..	429	464	451	445
Employee health insurance	1,971	1,952	1,941	1,901
Workman's compensation	557	1,040	1,040	1,113
FICA	37	34	39	39
Incentive awards	81	84	53	84
Severance pay	<u>1</u>	<u>57</u>	<u>255</u>	<u>44</u>
Total	<u>10,007</u>	<u>10,297</u>	<u>10,946</u>	<u>10,702</u>

The increase from the 1978 budget is primarily due to the 1978 pay increases partially offset by personnel reductions. The reduction in 1979 is due to lower personnel levels and a decrease in severance pay.

B. <u>Supporting Costs</u>	<u>554</u>	<u>518</u>	<u>384</u>	<u>371</u>
1. Transfer of personnel	247	196	246	196

The estimated costs (based on the number and the historical average cost of relocations) provide for certain relocation costs, such as the expenses of selling and buying a home and the movement of household goods. The increase shown for 1978 is due to the establishment of the Spacelab resident office in support of the European Space Agency. In 1979 these relocations will be largely completed.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>Budget</u> <u>Estimate</u>
2. Personnel training	307	322	138	175

The purpose of the MSFC training program is to continue the development of skills and knowledge of civil service employees in order to more efficiently support NSFC's roles and missions in the Space program. The benefits to be derived by NASA, from the training and educational programs conducted at MSFC, include: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical work force; development of needed skills and knowledge required in MSFC mission activities; and extending MSFC work force capability and increasing productivity. The decrease in the 1978 current estimate from the 1978 budget estimate resulted from the funding of other Center requirements that had a higher priority than training. The increase in 1979 allows for a competent training plan.

TRAVEL

II. <u>TRAVEL</u>	<u>2.141</u>	<u>2.291</u>	<u>2.216</u>	<u>2.382</u>
-------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Program Travel.....	1,962	1,991	2,003	2,157
B. Scientific and Technical Development	25	30	27	30
C. Management and Operations Travel	<u>154</u>	<u>270</u>	<u>186</u>	<u>195</u>
Total, Travel.....	<u>2.141</u>	<u>2.291</u>	<u>2.216</u>	<u>2.382</u>
A. <u>Program Travel</u>	1,962	1,991	2,003	2,157

Program travel is directly related to the accomplishment of the Center's mission and is approximately 90 percent of the total MSFC travel. This will require approximately 6,100 trips in 1979, an increase of approximately 100 trips over those expected in 1978. This increase in trips is a result of MSFC participation in program activities with additional program interfaces. Travel requirements include those for

on-going programs such as the Shuttle; including Space Shuttle Main Engine, External Tank and Solid Rocket Booster; Spacelab, Interim Upper Stages, Space Telescope, High Energy Astronomy Observatory, and space science and applications payloads. Increased travel is expected for Spacelab, Spacelab Payloads and Space Telescope in both domestic and European trips.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
B. <u>Scientific and Technical Development</u>	<u>25</u>	<u>30</u>	<u>27</u>	<u>30</u>

Scientific and Technical Development travel permits employees to participate in meetings and technical seminars with representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside MSFC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve problems for the benefit of the Government.

C. <u>Management and Operations Travel</u>	<u>154</u>	<u>270</u>	<u>186</u>	<u>195</u>
--	------------	------------	------------	------------

Management and Operations Travel is required for the direction and coordination of general management matters. It includes travel by managers in such areas as personnel, financial management, and procurement activities and travel of the Center's top management to NASA Headquarters, other NASA Centers, and local transportation.

FACILITIES SERVICES

The Marshall Space Flight Center (MSFC) occupies 1,840 acres of grounds in a complex of science and engineering laboratories, special development, and test facilities.

This complex encompasses 3,700,000 gross square feet of building space including 18 major buildings. Also included are 17 major technical facilities. This physical plant houses an average daily on-Center population of 5,300 to 5,800 personnel. Many of the test facilities are utilized on more than one shift or during off-peak hours.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
III. <u>FACILITIES SERVICES</u>	<u>11,436</u>	<u>11,016</u>	<u>10,488</u>	<u>10,598</u>

Basis of Fund Requirements

A. Maintenance and Related Services

1. Facilities.....	3,041	1,637	1,604	1,290
2. Equipment.....	<u>118</u>	<u>41</u>	<u>88</u>	<u>94</u>
Subtotal..	3,159	1,678	1,692	1,384

B. <u>Custodial Services</u>	2,506	2,757	2,415	2,682
------------------------------------	-------	-------	-------	-------

C. <u>Utility Services</u>	<u>5,771</u>	<u>6,581</u>	<u>6,381</u>	<u>6,532</u>
----------------------------------	--------------	--------------	--------------	--------------

Total, Facilities Services...	<u>11,436</u>	<u>11,016</u>	<u>10,488</u>	<u>10,598</u>
-------------------------------	---------------	---------------	---------------	---------------

A. <u>Maintenance and Related Services</u>	<u>3,159</u>	<u>1,678</u>	<u>1,692</u>	<u>1,384</u>
--	--------------	--------------	--------------	--------------

1. Facilities.....	3,041	1,637	1,604	1,290
--------------------	-------	-------	-------	-------

a. Maintenance of buildings and ground.....				944
---	--	--	--	-----

This activity involves a total of some 235 facilities (buildings, structures, and trailers) with some 3.7 million gross square feet of floor area. Also involved are over 1,840 acres of land area, 1 million square yards of pond acres, and several special structures and systems.

The estimate includes 23 workyears of effort and reimbursements to the Army (Redstone Arsenal) for facility maintenance and related services to such items as electrical distribution lines and paved surfaces.

The decrease in 1979 over 1978 reflects reductions in facility design and engineering efforts as well as in minor building repairs and modifications.

	1978		1979
1977	Budget	Current	Budget
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
	(Thousands of Dollars)		

b. Supplies and Materials..... 346

This estimate provides for the acquisition of building materials, electrical materials, electronic materials, general maintenance materials, general operating materials, general service materials, metals, gauges, pipes, valves and fittings.

2. Equipment..... 118 41 88 94

This activity involves maintenance and repair of over 3,800 items of building equipment at MSFC and remains at approximately the same level as in 1978.

B. Custodial Services..... 2,506 2,757 2,415 2,682

Custodial services includes janitorial services, security services, fire protection, trash removal, sanitary landfill operations, pest control activities, and related supplies and materials. The increase in 1979 provides for the full year funding of the support contract at the current wage rates.

1. Janitorial Services..... 2,189

This activity provides service to about three million square feet of facility space and trash removal from 130 separate locations. Work is performed through a support contract with a level of effort of 142 work years.

2. Security and Fire Protection..... 472

Services are provided through reimbursement to the Army (Redstone Arsenal). Included are 24 hour security coverage of MSFC property, law enforcement, motor vehicle control and registration, as well as fire protection.

3. Minor Requirements..... 21

Services are related to landfill operations and "as needed" pest control.

	1977 <u>Actual</u>	1978 Budget <u>Estimate</u> (Thousands	1978 Current <u>Estimate</u> of Dollars)	1979 Budget Estimate
C. <u>Utilities Services</u>	5,771	6,581	6,381	6,532

The Army (Redstone Arsenal) provides electricity, steam, water, and sewage disposal services to MSFC on a reimbursable basis, and the estimates, therefore, are included in this activity. Also included are seven workyears of effort to operate and maintain 12 separate steam boilers for facilities not on the central system, the combined utility system for Buildings 4200, 4201, and 4202, the environmental control systems, and to provide a nonduty hour focal point for emergencies. The cost of this effort is estimated at \$219,000.

The remaining \$6,313,000 is for utilities services as follows:

1. Electricity (93,00 mW/Hrs.)	2,430
2. Propane (51,000 gals.)	19
3. Fuel oil (744,000 gals.)	279
4. Steam (491,000 K/lbs.)	3,074
5. Water and sewage	511

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u>	7,707	6,728	6,072	6,418
-------------------------------------	-------	-------	-------	-------

Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment	809	770	765	803
2. Operations	4,134	3,498	3,206	3,521
Subtotal.....	4,943	4,268	3,971	4,324

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
B. <u>Scientific and Technical Information</u>				
1. Library.....	804	840	838	761
2. Education and information.....	<u>122</u>	<u>125</u>	<u>126</u>	<u>126</u>
Subtotal.....	<u>926</u>	<u>965</u>	<u>964</u>	<u>887</u>
C. <u>Shop Support and Services</u>	<u>1,838</u>	<u>1,495</u>	<u>1,137</u>	<u>1,207</u>
Total, Technical Services....	<u>7,707</u>	<u>6,728</u>	<u>6,072</u>	<u>6,418</u>
A. <u>Automatic Data Processing</u>	<u>4,943</u>	<u>4,268</u>	<u>3,971</u>	<u>4,324</u>

Provides centralized systems analysis, programming, operations, and related computational services to meet the management, administrative computing requirements, and related supplies and materials. Also includes maintenance of ADP equipment. Included are 173 workyears of support contract effort.

1. Equipment.....	809	770	765	803
-------------------	-----	-----	-----	-----

Maintenance is provided under separate contracts for central site computers and associated equipment. Equipment maintained includes the two large Univac 1108 systems, the CalComp Disc secondary storage system for the Univac 1108 system, the Stromberg 4060 computer graphics output system and the key-to-disc which collects, controls, organizes, and edits raw data for input into Univac 1108 system. The increase from 1978 reflects the full year effect of previously negotiated contractor wage rates.

2. Operations.....	4,134	3,498	3,206	3,521
--------------------	-------	-------	-------	-------

This function provides for the development and utilization of computer techniques and systems programming of all digital computers and associated equipment at MSFC. The computer systems include two large Univac 1108 systems, seven Univac 9300 Remote Job Entry terminals, an IBM 360/75, and IBM 360/44,

one IBM 1401 and two FR-80 Electronic plotters, and a Stromberg Data 4060 Electronic Plotter. Also included is associated auxiliary support equipment such as film processors, Xerox microfiche printers, Xerox forms copiers, and punch card accounting machines (PCAM). Also included are the operation of two large magnetic tape libraries containing a combined total of 60,000 reels; receipt, control, and distribution of programs and data processing products; testing and cleaning of magnetic tapes.

Also included in the operation costs are program design and development, and development of data base management, configuration management, and accounting software systems. Support is also provided for developing engineering drawings and parts management systems. The modest increase from the 1978 level is due to increased requirements for computing services and the full year effect of negotiated contractor wage rate increases.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u>		1979 <u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
B. <u>Scientific and Technical Information</u>	<u>926</u>	<u>965</u>	<u>964</u>	<u>887</u>

This activity provides for the operation of the Redstone Scientific Information Center library at MSFC and support to the Center in various scientific and technical information services.

1. Library.....	804	840	838	761
-----------------	-----	-----	-----	-----

Scientific information and library services are provided to MSFC employees and associated contractor personnel through the Redstone Scientific Information Center (RSIC) operations. The RSIC contains a central collection of 198,000 books and journals, 2,800 periodicals, 1,000,000 documents on microfilm and 400,000 technical papers. Operation of the RSIC by the Army is under direction of a joint MSFC/Army Redstone Scientific Information Board with costs shared. The decrease from 1978 is due to a planned reduction in the level of library support with access to a lesser number of periodicals and reports.

2. Education and information.....	122	125	126	126
-----------------------------------	-----	-----	-----	-----

The funds provide for the preparation of reproducible pages for publication of technical manuscripts and related documents. The annual volume of work under this contract is an estimated 12 thousand manuscript pages. Also included is MSFC's share of the operation of the MSFC Visitor Information Center located at the Alabama Space and Rocket Center to inform visitors and the public regarding NASA, the Space programs and the MSFC role in particular. This effort is being maintained at the current level of funding.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Shop Support and Service</u>	<u>1,838</u>	<u>1,495</u>	<u>1,137</u>	<u>1,207</u>

Thirty-four workyears of support contractor effort provide the Center with support in the areas of graphics, models and design, construction, and management of exhibits. Related supplies, materials and equipment are also included in this activity. Graphic materials are prepared for use in such presentations as senior management meetings. The increase from 1978 reflects the full year effect of 1978 cost increases.

1. Instrumentation support 59

This category is composed of various contracts for maintenance and repair of institutional laboratory equipment and gauge calibration, much of which is procured from the Army. They include microwave, radio frequency, optical and acoustic instrumentation calibration.

2. Photographic services..... 380

Consists of procurement of off-site commercial still photographic and motion picture production services. Still photographic services include printing and processing of color and black and white prints, slides, vugraphs, and copy camera photography. Motion picture production services include script writing; film editing; sound recording; and printing and processing of sound motion pictures. Approximately 138,000 still photo units and 50 reels (10 min. each) of motion picture service are procured annually.

3. Graphics 768

Thirty four workyears of support contractor effort are required for the preparation of charts, graphs, vugraphs and similar visuals for administrative and operational requirements are included in this activity. Approximately 28,000 work units are completed annually. Also includes the design, construction, and management of exhibits in connection with MSC Public Affairs activity.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
<u>MANAGEMENT AND OPERATIONS</u>				
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>7.382</u>	<u>6.471</u>	<u>6.951</u>	<u>7.046</u>
<u>Basis of Fund Requirements</u>				
A. Administrative Communications.....	2,484	2,311	2,525	2,477
B. Printing and Reproduction.....	383	362	360	380
C. Transportation.....	1,738	1,578	1,656	1,777
D. Installation Common Services.....	<u>2,777</u>	<u>2,220</u>	<u>2,410</u>	<u>2,412</u>
Total, Management and Operations.....	<u>7.382</u>	<u>6.471</u>	<u>6.951</u>	<u>7.046</u>
A. <u>Administrative Communications</u>	2,484	2,311	2,525	2,477

Communications support for MSFC, which includes 25 workyears of effort, consists of local telephone service, long distance telephone service, and various kinds of other nontelephone communications. The decrease in 1979 is due to a planned reduction of main lines and instruments partially offset by the full year effect of support contractor wage increases, the cost of associated materials and equipment, and current service rates.

1. Local telephone service..... 613

The MSFC Central Exchange provides instruments and lines at the Center for local telephone service. The reduction from 1978 is due to a planned reduction of main lines and instruments partially offset by the full year effect of increased rates for the telephone services procured from South Central Bell Telephone Company.

1977 <u>Actual</u>	1978		1979
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
	(Thousands of Dollars)		

2. Long distance telephone service..... 748

Provides for MSFC use of the General Services Administration operated long distance Federal Telecommunications System telephone network. Costs result from a formula which is based primarily on the number of calls made two years in the past and the number of circuits used by the Center. Also included are such items as Western Union leased equipment for transmitting and receiving telegraphic messages and the Autodin network for ordering supplies and materials and sending and receiving classified information. The increase from FY 1978 is based on past usage levels at GSA rates, and increased leasing costs.

3. Nontelephone communications..... 1,116

These funds provide for use of Weeden Mountain radio transmission facilities; support of the Emergency Warning System; and operation of MSFC Fire Surveillance System. Also provided are payments to the U.S. Postal Service for postage, entry into the GSA teletype system for Government subscribers, entry into the Western Union teletype system for commercial subscribers, overseas telegrams and cable system upkeep and equipment storage by the Army. Twenty-five workyears of support contractor effort is required to provide around-the-clock institutional communications capability, including installation, operation, maintenance and repair of 2,100 capital equipment items; 360,590 operating feet of cable; handling 90,000 telephone calls by operators on three switchboards; receiving/transmitting teletype messages; making 6,000 telephone directoty changes; processing 3,000 video tapes and 875 engineering drawings. The increase from 1978 is due primarily to the full year effect of 1978 support contractor wage rate increases.

B. Printing and Reproduction..... 383 362 360 380

A portion of MSFC's printing requirements are met by an on-site printing plant operated by MSFC personnel. This printing plant produces approximately 18,000,000 units of printing each year. Included in the cost of operating this plant is four support contractor workyears of effort. In addition to this on-site printing plant, MSFC must also purchase from the Government Printing Office, Army and private firms about 16,000,000 units of printing each year. This purchased printing is a combination of an overflow requirement that cannot be handled with the on-site workload, or is of such a type that it cannot be handled with the limited capability of the on-site equipment. The increase from 1978 reflects increased costs in off-site procurements.

	<u>1977</u> <u>Actual</u>	<u>1978</u> Budget Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		<u>1979</u> Budget <u>Estimate</u>
C. Transportation.....	1,738	1,578	1,656	1,777

Transportation functions at MSFC include 63 workyears of support contractor effort for operation and maintenance of vehicles and aircraft, and transportation of things. Included in this category is the maintenance of 418 general purpose vehicles, 108 general and special purpose trailers and vehicles, 290 pieces of equipment such as "A" frame cranes, "H" frame cranes, cranes, tractors, generators, and welders; intermediate inspection at 6,000 miles or six months; and major inspections at 12,000 miles or twelve months. Freight charges for shipment by both surface and air transportation of materials and equipment are also included. The increase in funds is due mainly to increased costs of support contracts.

D. <u>Installation Common Services</u>	<u>2,777</u>	<u>2,220</u>	<u>2,410</u>	<u>2,412</u>
---	--------------	--------------	--------------	--------------

This category includes 28 workyears of support contractor effort and provides support to Center Management and staff activities, medical services, and various other installation support services. The decrease from 1978 is primarily in the purchase of fewer supplies and materials, somewhat offset by increased wage rates in the medical services contracts.

1. Center management and staff functions.....	41
---	----

Includes Patent Counsel Services, Tort Claims and Equal Opportunity activities.

2. Medical services.....	672
--------------------------	-----

Provides occupational medicine and environmental health services for the maintenance and improvement of employee health at MSFC, with emphasis on prevention, diagnosis, treatment and care of illnesses and injuries caused or aggravated by the work environment.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

3. Installation support services..... 1,699

Maintenance and repair of office equipment, equipment rental, acquisition of supplies and materials and miscellaneous services are included in this activity.

a. Maintenance and repair of equipment..... 354

Maintenance and repair of office equipment includes the maintenance and repair services for office machines and equipment (i.e., typewriters, calculators, time stamp equipment, etc.); maintenance and repair services for photographic and reproduction equipment (i.e., enlargers, cameras, exposure controls, print copiers, projectors, power supplies, tape recorders, stroboflash, film viewer, motion analyzer, copiers, copy camera, processor camera, super diazo, etc.).

b. Rental of equipment..... 185

Rental of equipment such as Xerox machines at the resident office at Canoga Park, California and Visual Search Microfilm Files located at MSFC, and other reproduction equipment are included in this category.

c. Supplies, materials, and equipment..... 878

Acquisition of the following types of supplies and materials: fuels and lubricants, metals, vehicles, office supplies, office equipment, medical supplies and equipment, and communications supplies and equipment.

d. Miscellaneous services..... 282

This estimate includes services such as miscellaneous troop service charges for military detailees assigned to MSFC; disposal of toxic wastes; inspection of hazardous cargo prior to entry to Redstone Arsenal; receipt, storage, and issue services for hazardous compounds such as explosives, pyrotechnics and solid rocket motors. Minor commercial contracts include, repair of safety shoes, furniture repair, potassium cyanide disposal and logistics support.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GEORGE C. MARSHALL SPACE FLIGHT CENTER

OFFICE OF DIRECTOR			
	FY-76	FY-77	FY-78
EXCEPTED	3	3	
OS-16	0	0	
OS-15	0	0	
OS-14	0	0	
ALL OTHER OS	5	5	
WAGE BOARD	0	0	
TOTAL PERMANENT	8	8	

MSFC SUMMARY			
	FY-76	FY-77	FY-78
EXCEPTED	40	40	
OS-16	11	11	
OS-15	214	208	
OS-14	300	344	
ALL OTHER OS	2994	2940	
WAGE BOARD	14	14	
TOTAL PERMANENT	3760	3555	

ASSOCIATE DIRECTOR FOR SCIENCE			
	FY-76	FY-77	FY-78
EXCEPTED	1	1	
OS-16	0	0	
OS-15	1	1	
OS-14	0	0	
ALL OTHER OS	1	1	
WAGE BOARD	0	0	
TOTAL PERMANENT	3	3	

EXECUTIVE STAFF			
	FY-76	FY-77	FY-78
EXCEPTED	8	8	
OS-16	0	0	
OS-15	2	2	
OS-14	3	3	
ALL OTHER OS	9	9	
WAGE BOARD	0	0	
TOTAL PERMANENT	14	14	

SAFETY OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	0	0	
OS-16	0	0	
OS-15	1	1	
OS-14	5	5	
ALL OTHER OS	73	73	
WAGE BOARD	0	0	
TOTAL PERMANENT	79	79	

PUBLIC AFFAIRS OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	0	0	
OS-16	0	0	
OS-15	0	0	
OS-14	1	1	
ALL OTHER OS	17	17	
WAGE BOARD	0	0	
TOTAL PERMANENT	18	18	

CHIEF COUNSEL			
	FY-76	FY-77	FY-78
EXCEPTED	1	1	
OS-16	0	0	
OS-15	1	1	
OS-14	3	3	
ALL OTHER OS	9	9	
WAGE BOARD	0	0	
TOTAL PERMANENT	14	14	

CENTER COMPTROLLER			
	FY-76	FY-77	FY-78
EXCEPTED	1	1	
OS-16	0	0	
OS-15	2	2	
OS-14	0	0	
ALL OTHER OS	47	47	
WAGE BOARD	0	0	
TOTAL PERMANENT	50	50	

PERSONNEL OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	0	0	
OS-16	0	0	
OS-15	1	1	
OS-14	4	4	
ALL OTHER OS	52	52	
WAGE BOARD	0	0	
TOTAL PERMANENT	57	57	

EQUAL OPPORTUNITY OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	0	0	
OS-16	0	0	
OS-15	1	1	
OS-14	1	1	
ALL OTHER OS	0	0	
WAGE BOARD	0	0	
TOTAL PERMANENT	2	2	

SHUTTLE PROJECTS OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	5	5	
OS-16	1	1	
OS-15	34	34	
OS-14	94	94	
ALL OTHER OS	100	100	
WAGE BOARD	0	0	
TOTAL PERMANENT	240	240	

MICHAUD ASSEMBLY FACILITY			
	FY-76	FY-77	FY-78
EXCEPTED	0	0	
OS-16	0	0	
OS-15	0	0	
OS-14	0	0	
ALL OTHER OS	125	125	
WAGE BOARD	0	0	
TOTAL PERMANENT	125	125	

SPECIAL PROJECTS OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	1	1	
OS-16	0	0	
OS-15	3	3	
OS-14	21	21	
ALL OTHER OS	73	73	
WAGE BOARD	0	0	
TOTAL PERMANENT	97	97	

SPACE TELESCOPE PROJECT OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	2	2	
OS-16	0	0	
OS-15	0	0	
OS-14	0	0	
ALL OTHER OS	71	71	
WAGE BOARD	0	0	
TOTAL PERMANENT	73	73	

SPACEFLIGHT PROGRAM OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	3	3	
OS-16	1	1	
OS-15	8	8	
OS-14	13	13	
ALL OTHER OS	24	24	
WAGE BOARD	0	0	
TOTAL PERMANENT	48	48	

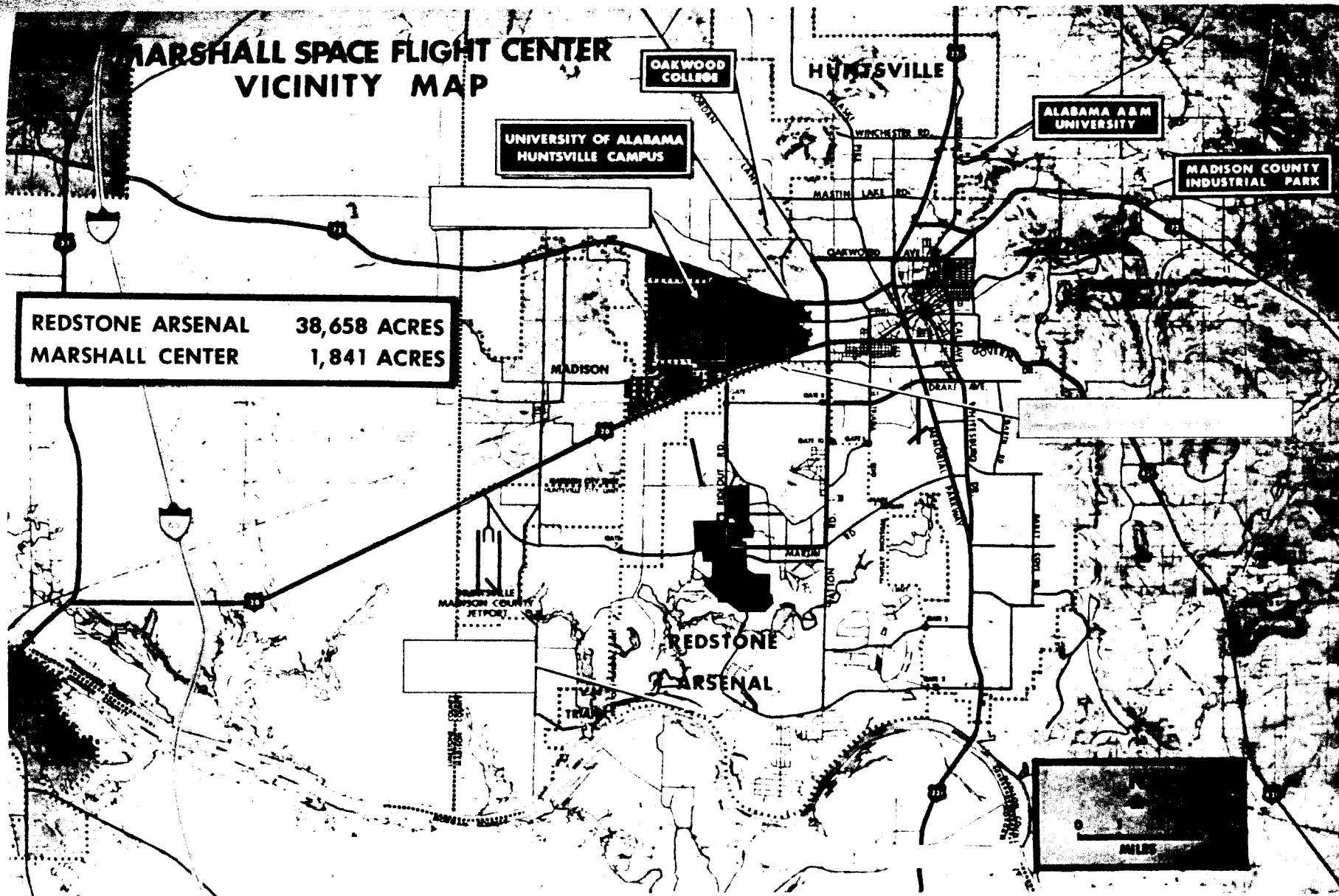
SPACEFLIGHT PAYLOAD PROJECT OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	2	2	
OS-16	1	1	
OS-15	0	0	
OS-14	10	10	
ALL OTHER OS	41	41	
WAGE BOARD	0	0	
TOTAL PERMANENT	54	54	

SPACE SCIENCE PROJECTS OFFICE			
	FY-76	FY-77	FY-78
EXCEPTED	0	0	
OS-16	1	1	
OS-15	7	7	
OS-14	11	11	
ALL OTHER OS	0	0	
WAGE BOARD	0	0	
TOTAL PERMANENT	19	19	

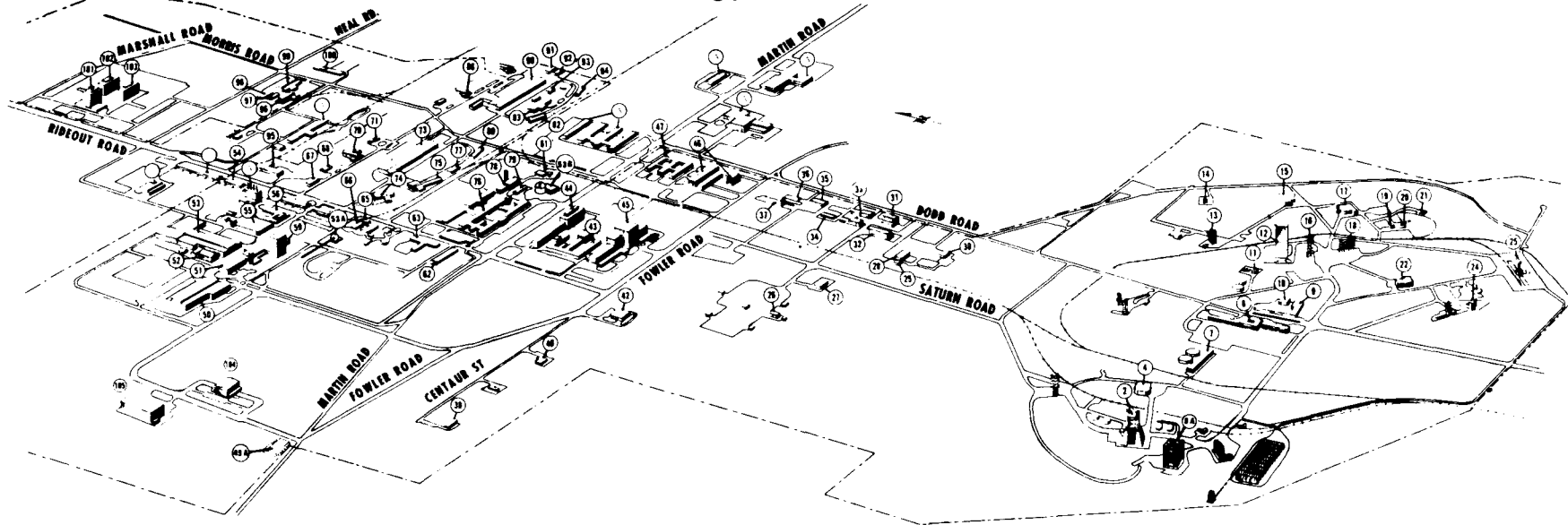
PROGRAM DEVELOPMENT			
	FY-76	FY-77	FY-78
EXCEPTED	0	0	
OS-16	0	0	
OS-15	20	20	
OS-14	44	44	
ALL OTHER OS	93	93	
WAGE BOARD	0	0	
TOTAL PERMANENT	157	157	

SCIENCE AND ENGINEERING			
	FY-76	FY-77	FY-78
EXCEPTED	22	22	
OS-16	7	7	
OS-15	114	110	
OS-14	361	348	
ALL OTHER OS	1000	1030	
WAGE BOARD	0	0	
TOTAL PERMANENT	2104	2115	

ADMINISTRATION & PROGRAM SUPPORT			
	FY-76	FY-77	FY-78
EXCEPTED	0	0	
OS-16	0	0	
OS-15	17	17	
OS-14	42	42	
ALL OTHER OS	801	812	
WAGE BOARD	14	14	
TOTAL PERMANENT	874	885	



MARSHALL SPACE FLIGHT CENTER SITE PLAN



HEADQUARTERS AREA

- 95 4207 COMMUNICATIONS FACILITY
- 96 4241 SHOP AND STORAGE BUILDING
- 97 S-4244 STORAGE BUILDING
- 98 S-4251 EQUIPMENT SHED
- 99 4250 OFFICE AND SHOP BUILDING
- 100 4245 OFFICE BUILDING
- 101 4200 OFFICE BUILDING
- 102 4206 OFFICE BUILDING
- 103 4201 OFFICE BUILDING

LAB AND SUPPORT AREA

- 38 4628 LABORATORY BUILDING
- 40 4623 LABORATORY BUILDING
- 42 4605 NON-DESTRUCTIVE EVALUATION LABORATORY
- 43 4612 MATERIALS LABORATORY
- 44 4610 OFFICE AND ENGINEERING BUILDING
- 45 4619 STRUCTURES AND MECHANICS LABORATORY
- 46 4650 SHOP AND CALIBRATION LABORATORY
- 47 4663 COMPUTER FACILITY
- 49A 4740 WATER POLLUTION CONTROL FACILITY
- 50 4708 ENGINEERING AND DEVELOPMENT LABORATORY
- 51 4760 SURFACE TREATMENT FACILITY
- 52 S-4706 NEUTRAL BUOYANCY FACILITY
- 53 4706 FABRICATION AND MACHINE SHOP
- 53A 4775 HIGH REYNOLDS FACILITY
- 53B 4667 CELESTIAL & OPTICAL SENSORS FACILITY

- 54 4723 TRAINING FACILITY
- 55 4711 DEVELOPMENTAL PROCESSES LABORATORY
- 56 4712 OFFICE BUILDING
- 59 4777 SHOP AND ASSEMBLY BUILDING
- 62 S-4747 AIR COMPRESSOR BUILDING
- 63 477M CALIBRATION LABORATORY
- 65 4732 BISONIC WIND TUNNEL FACILITY
- 66 4733 IMPULSE BASE FLOW FACILITY
- 67 4306 OFFICE BUILDING
- 68 4313 OFFICE BUILDING
- 71 4332 ENVIRONMENTAL TEST LABORATORY
- 73 4471 STORAGE AND OFFICE BUILDING
- 74 4485 OFFICE BUILDING
- 75 4491 OFFICE AND LABORATORY BUILDING
- 76 4487 LABORATORY AND OFFICE BUILDING
- 77 S-4479 STORAGE BUILDING
- 78 4476 ENVIRONMENTAL TEST FACILITY
- 79 S-4436 AUTOMATION CHECKOUT BUILDING
- 80 4492 ELECTRICAL SYSTEMS LABORATORY BUILDING
- 81 4475 HAZARDOUS OPERATIONS LABORATORY
- 82 4493 SHOP AND STORAGE BUILDING

- 83 4483 VEHICLE MAINTENANCE SHOP
- 86 4353 PHOTO LAB
- 90 4481 SPACE SCIENCES LABORATORY
- 91 S-4498 STORAGE BUILDING
- 92 S-4499 STORAGE BUILDING
- 93 4482 TRANSPORTATION SUPPORT BUILDING
- 94 4494 CEMER ACTIVITIES BUILDING
- 104 4752 MULTIPURPOSE HIGH BAY FACILITY
- 105 4755 HIGH BAY ASSEMBLY FACILITY

TEST AREA

WEST AREA

- 2 4670 PROPULSION & STRUCTURAL TEST FACILITY
- 4 4670 BLOCKHOUSE
- 4 4674 PUMP HOUSE
- 8 4667 OFFICE BUILDING
- 8A 4666 STRUCTURAL TEST FACILITY
- 8A 4694

EAST AREA

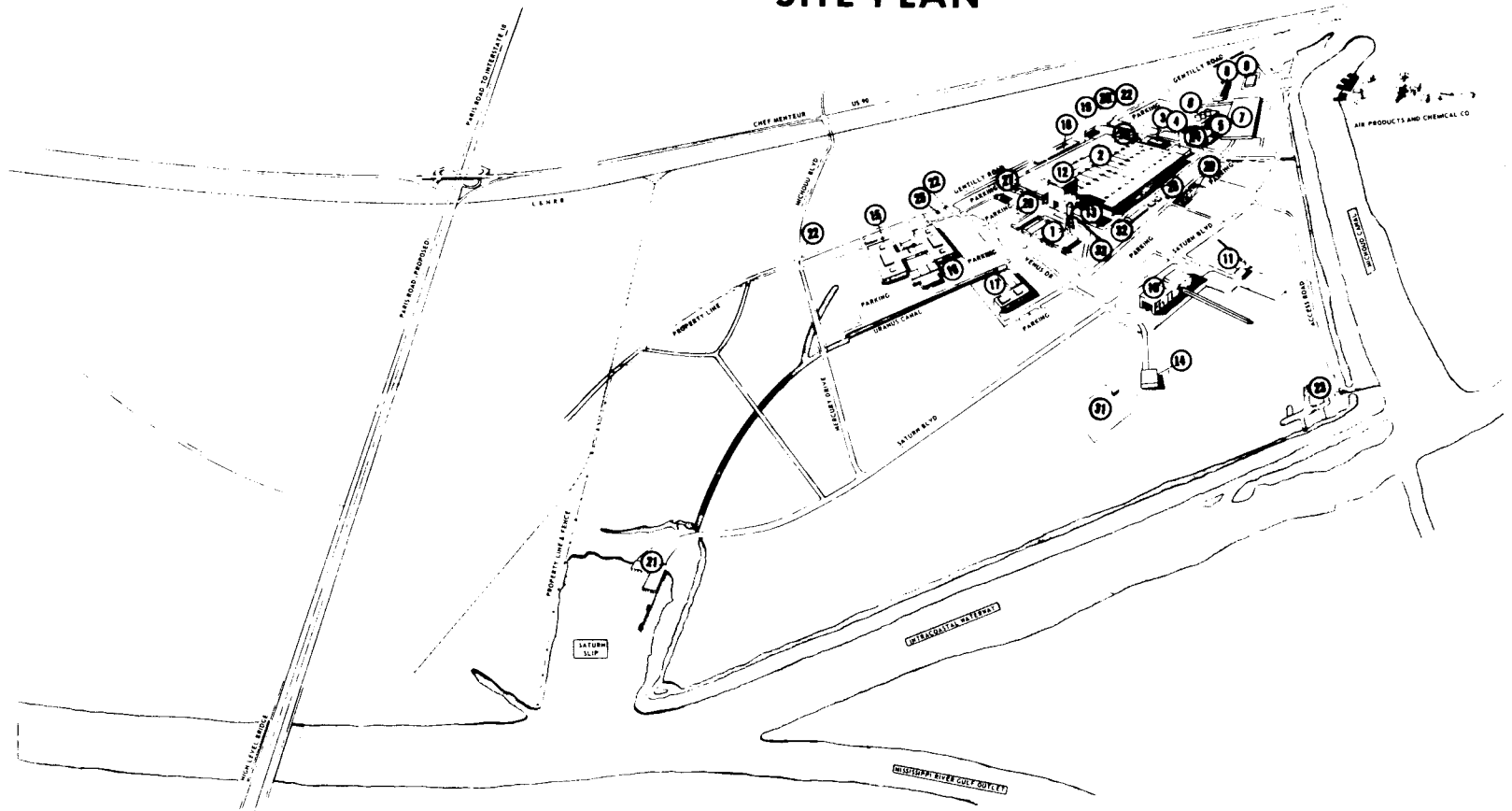
- 9 4566 DOCUMENTATION REPOSITORY
- 10 4567 PUMP AND BOILER HOUSE
- 11 S-4549 DEIONIZED WATER PLANT

- 12 4550 STRUCTURAL TEST FACILITY
- 13 4522 PROPULSION SYSTEMS COMPONENT TEST STAND
- 14 4530 PROPULSION SYSTEMS COMPONENT TEST STAND
- 15 4561 SHOP AND LABORATORY BUILDING
- 16 4557 STRUCTURAL TEST FACILITY
- 17 4583 TEST AND DATA RECORDING FACILITY
- 18 4549 PROPULSION SYSTEMS COMPONENT TEST FACILITY
- 19 S-4539 TEST STAND SUPPORT BUILDING
- 20 4540 MODEL PROPULSION SYSTEMS TEST STAND (ACOUSTIC)
- 21 4541 TEST STAND CONTROL BUILDING
- 22 4570 BLOCKHOUSE AND CABLE TUNNELS
- 24 4514 PROPULSION SYSTEMS TEST STAND
- 25 4572 PROPULSION AND STRUCTURAL TEST FACILITY

TEST SUPPORT AREA

- 26 4646 OFFICE BUILDING
- 27 4648 HIGH PRESSURE TEST FACILITY
- 28 S-4659 HP G₂ FACILITY
- 29 S-4660 BOILER PLANT
- 30 S-4647 COMPRESSOR BUILDING
- 31 S-4655 MULTIPURPOSE HIGH BAY FACILITY
- 32 S-4656 HYDRAULIC EQUIPMENT DEVELOPMENT FACILITY
- 33 S-4653 COMPONENTS SERVICE BUILDING
- 34 4678 OFFICE AND STORAGE BUILDING
- 35 S-4654 OFFICE BUILDING
- 36 S-4651 SHOP BUILDING
- 37 4649 MULTIPURPOSE HIGH BAY FACILITY

MICHOU D ASSEMBLY FACILITY SITE PLAN



MANUFACTURING AND ASSEMBLY

- 1 303 HANGAR
- 2 103 MANUFACTURING
- 3 111 LABORATORY
- 4 104 BATTERY CHARGING & STORAGE
- 5 207 BOILER HOUSE
- 6 202 COOLING TOWER
- 7 220 COMPONENT SUPPLY
- 8 203 MAINTENANCE SUPPLY
- 9 221 HAZARDOUS MATERIAL STORAGE

TEST FACILITIES

- 10 420 TEST & CHECKOUT FACILITY
- 11 404 HIGH PRESSURE TEST FACILITY
- 12 110 VERTICAL ASSEMBLY & HYDROSTATIC TEST

- 13 130 SYSTEMS ENGINEERING
- 14 451 PNEUMATIC TEST FACILITY

ENGINEERING ADMINISTRATION

- 15 350 OFFICE AND ENGINEERING BUILDING
- 16 351 CAFETERIA
- 17 320 CONTRACTOR SERVICES BUILDING
- 18 101 ADMINISTRATION
- 19 102 ENGINEERING
- 20 301 MAINTENANCE SHOP

TRANSPORTATION, UTILITIES / MISC

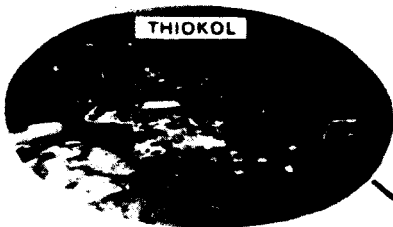
- 21 480 BARGE DOCK
- 22 GUARD HOUSE
- 23 450 MAIN PUMP STATION

- 24 201 PUMP STATION NO 1
- 25 304 PUMP STATION NO 3
- 26 143 PUMP STATION NO 4
- 27 308 WEST MASTER SUBSTATION
- 28 121 MAIN SUBSTATION
- 29 170 CHEMICAL WASTE LAGOON
- 30 119 PAINT SHOP
- 31 403 SALVAGE YARD
- 32 105 TRANSPORTATION
- 33 302 ELEVATED WATER TOWER

MARSHALL SPACE FL

PROGRAM F

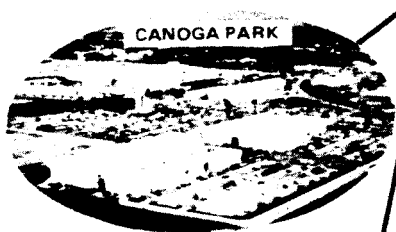
THIOL



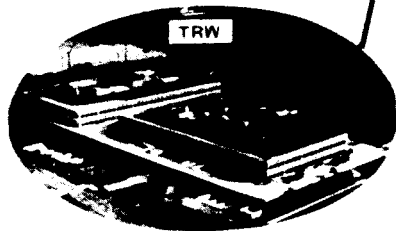
SANTA SUSANA



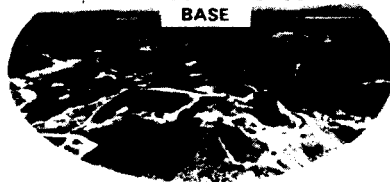
CANOGA PARK



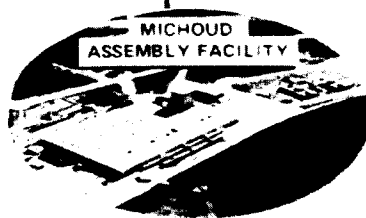
TRW



EDWARDS AIR FORCE
BASE



MICHOUD
ASSEMBLY FACILITY



SUTELL
COMPUTER COMPLEX



HUNTSVILLE



AERIAL VIEW OF - MSFC - HUNTSVILLE, ALABAMA

ADMINISTRATIVE COMPLEX

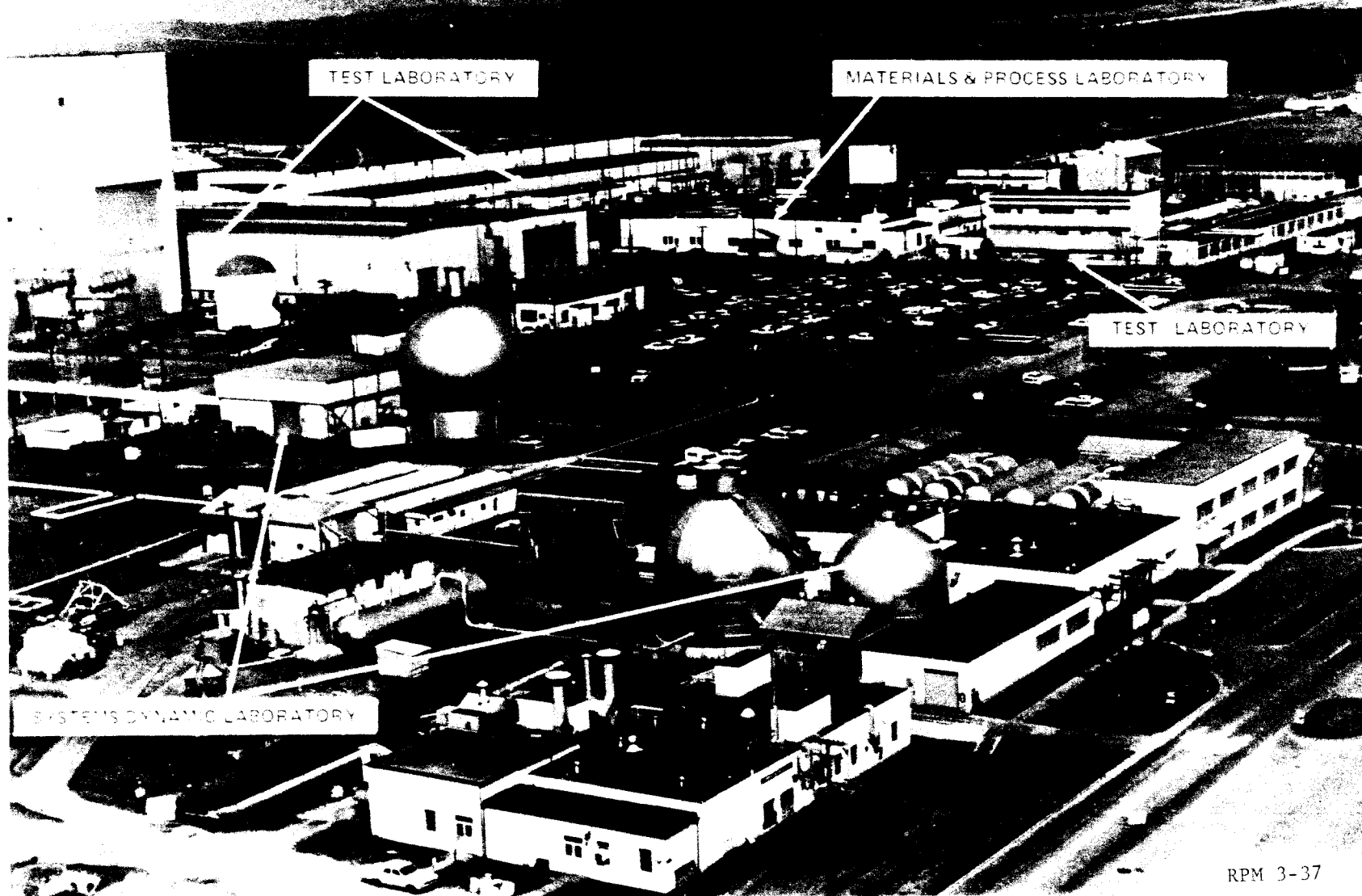
SPACE SCIENCES LABORATORY

ELECTRONICS & CONTROL LAB

STRUCTURES & PROPULSION LAB

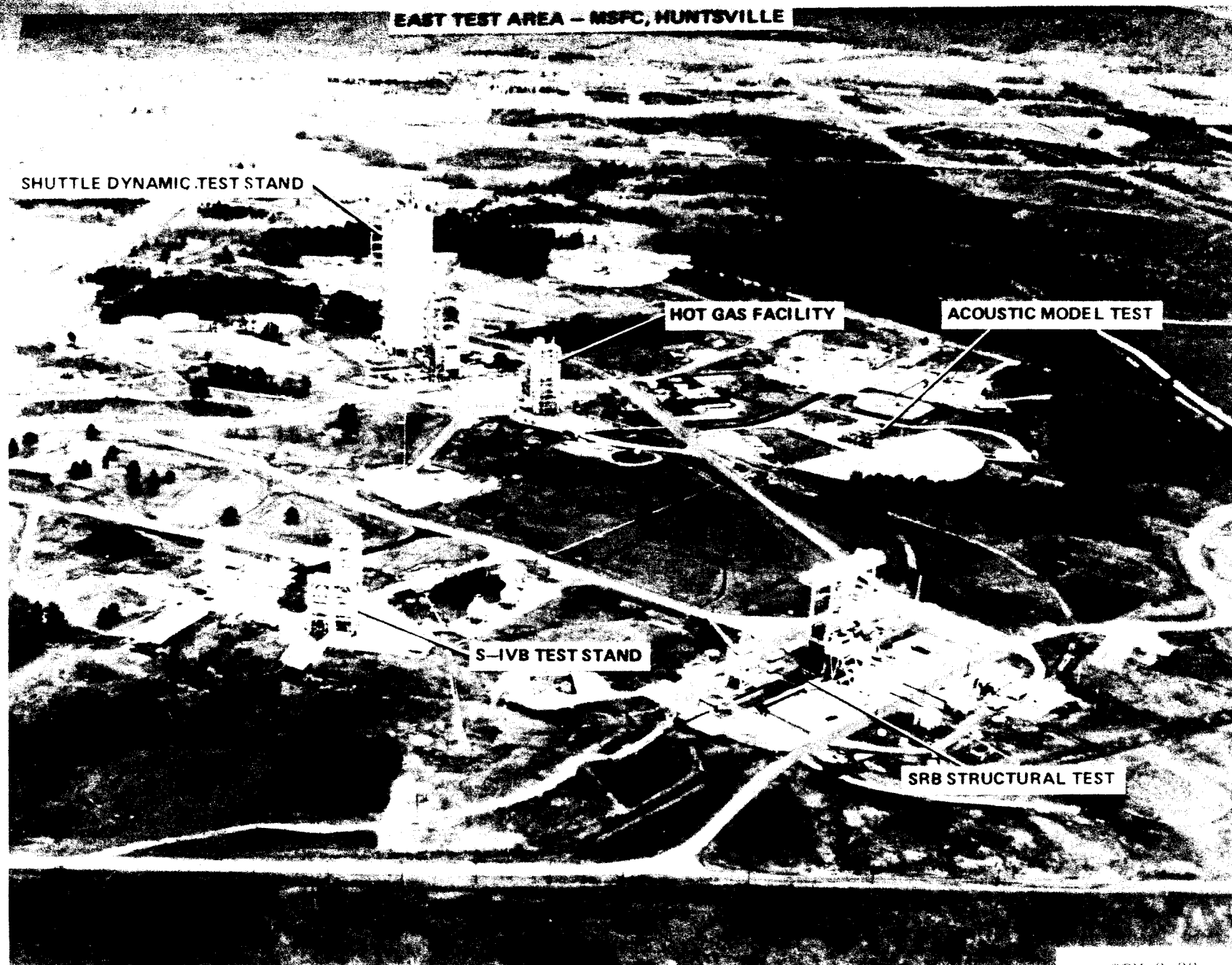
LOAD TEST ANNEX

SCIENCE & ENGINEERING AREA - MSFC, HUNTSVILLE



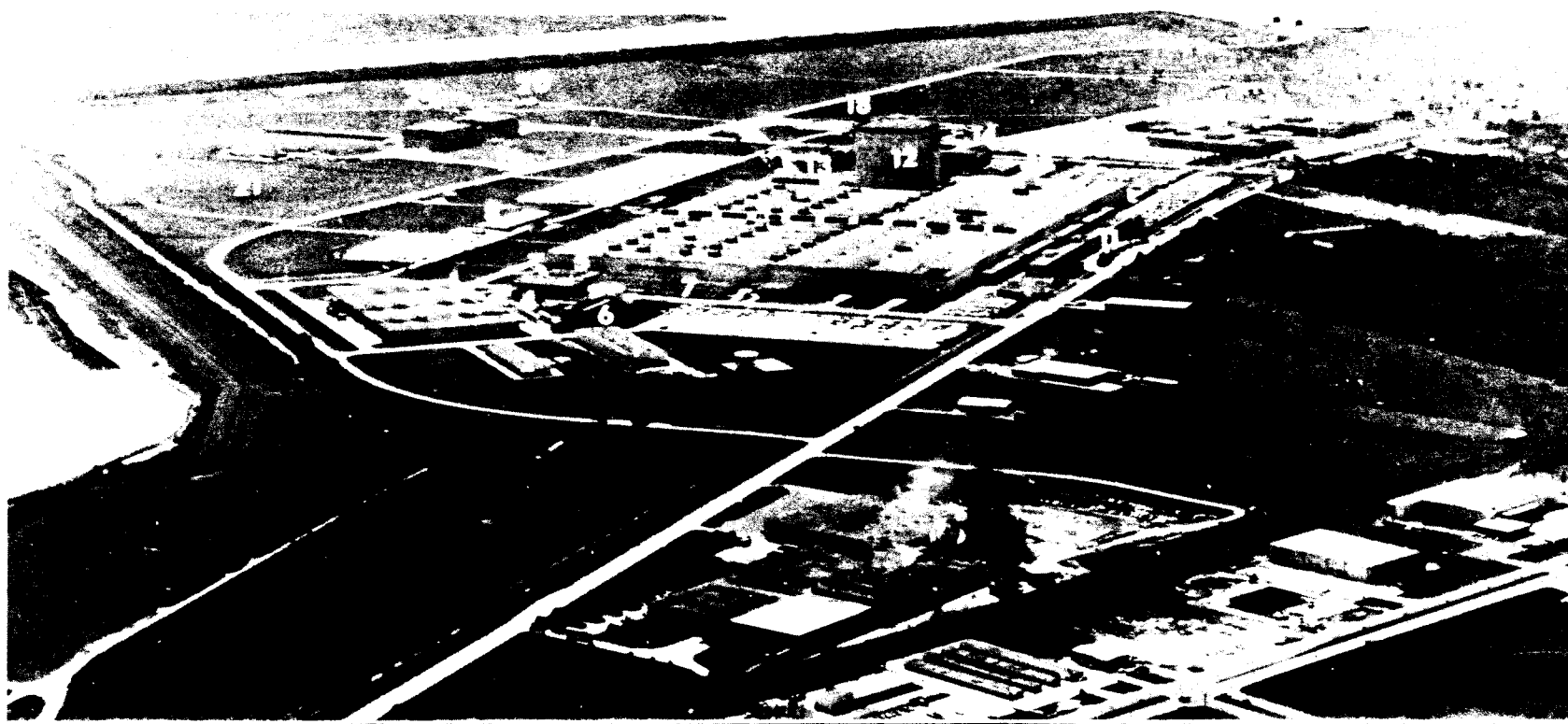
RPM 3-37

EAST TEST AREA - MSFC, HUNTSVILLE



RPM 3-38

MICHOUD ASSEMBLY FACILITY



1. MAINTENANCE SUPPLY
2. HAZARDOUS MATLS STORAGE
3. COMPONENT SUPPLY
4. BOILER PLANT & FUEL TANKS
5. BATTERY CHARGING
6. COOLING TOWER
7. LABORATORY
8. CHEMICAL WASTE RESERVOIR

9. FABAREA
10. FABAREA
11. ENGINEERING BUILDINGS
12. VERT ASSY & HYDROSTATIC TEST
13. SYSTEMS ENGINEERING BLDG
14. HANGAR
15. MAINTENANCE
16. ENGINEERING & OFFICE BLDG

17. CAFETERIA
18. CONTRACTOR SERVICES BLDG
19. TEST & CHECK OUT
20. SALVAGE YARD
21. HIGH PRESSURE TEST FACIL - TV
22. MAIN PUMPING STATION
23. BARGE DOCK
24. PNEUMATIC TEST FACIL TV

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

NATIONAL SPACE TECHNOLOGY LABORATORIES

DESCRIPTION

The National Space Technology Laboratories are located in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. Total land area is 138,807 acres of which 13,480 acres make up the actual installation owned by NASA. The remaining 125,327 acres are held as a buffer zone. In the buffer zone, 7,162 acres are owned by NASA, and 118,165 acres are under restrictive easements. The installation has deep water access via the Pearl River and the Intracoastal Waterway. Capital investment for the National Space Technology Laboratories as of September 30, 1977, was \$308,437,000.

CENTER ROLES AND MISSIONS

The National Space Technology Laboratories (NSTL), formerly the Mississippi Test Facility (MTF), was constructed and operated during the sixties for acceptance testing of the booster stages of the Saturn V rocket system. NSTL is NASA's prime static test facility for large liquid propellant rocket engines and propulsion systems. The redesignation by NASA of MTF to the new NSTL in June 1974 recognized the emerging role of the installation in space and environmental technology efforts.

NSIL is presently engaged in development and acceptance testing of the Space Shuttle Main Engines and development testing of the ground test version of the Shuttle Orbiter, and the Main Propulsion Test Article. NSIL conducts applied research, develops techniques and demonstrates and transfers to the user community applications of NASA-developed technology in the fields of remote sensing, satellite communication, environmental sciences, and other selected applications programs. NSIL manages the installation and, through interagency agreements, provides service support and full utilization of all facilities at NSIL by NASA and colocated elements of other executive agencies engaged in compatible research, development, and operational activities. These include the Department of Interior, the Department of Commerce, the Environmental Protection Agency, the Department of Transportation, the Department of Defense, the State of Mississippi, and the State of Louisiana. The principal roles are:

Space Shuttle - NSIL provides, maintains and manages the facilities and the related capabilities required for the development and acceptance testing of the Space Shuttle Main Engines and the development testing of the ground version of the Shuttle Orbiter, and the Main Propulsion Test Article.

conducts applied research, develops techniques, demonstrates and transfers to the community applications of NASA-developed technology in the fields of remote sensing, satellite communication and environmental sciences.

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FUNDS</u>	<u>1978</u>		<u>1979</u> Budget Estimate
		<u>1977</u> Actual	Budget Estimate (Thousands of Dollars)	
I. Personnel and Related Costs.....		1,792	1,910	2,714
II. Travel.....		48	32	50
III. Facilities Services.....		---	---	---
IV. Technical Services.....		---	---	---
V. Management and Operations.....		---	---	---
Total, fund requirements		<u>1.840</u>	<u>1.942</u>	<u>2.764</u>

Distribution of Permanent Positions by Programs

	<u>1977</u> Actual	<u>1978</u>		<u>1979</u> Budget Estimate
		Budget Estimate	Current Estimate	
<u>Direct Positions</u>				
Space and Terrestrial Applications	---	---	38	40
Space applications	---	---	38	40
Subtotal, direct positions	---	---	38	40
<u>Center Management and Operations Support Positions.....</u>	<u>70</u>	70	62	64
Total, permanent positions	<u>70</u>	<u>70</u>	<u>100</u>	<u>104</u>

PROGRAM DESCRIPTION

SPACE AND TERRESTRIAL APPLICATIONS

40 Permanent Positions (Civil Service)

In FY 1979 the National Space Technology Laboratories' Earth Resources Laboratory's program will continue:

- a. To conduct research investigations in the application of remotely sensed data, stressing interests and needs of potential user agencies. This research activity uses existing aircraft and satellite programs as a basic source of remotely sensed data in conjunction with surface data to develop techniques and procedures for practical applications, and to devise cost-effective methods of transfer of those techniques to the user agencies.
- b. To conduct technology transfer demonstrations and provide orientation and hands-on experience and technology implementation assistance to federal, state, industrial, private and educational users.
- c. To conduct research, develop applications and transfer technology to the user community in non-remote sensing applications primarily in such areas *as* data collection systems, environmental systems development, and closed ecosystems development.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

64 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or services being provided to all National Space Technology Laboratories organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Manager, Deputy Director, and immediate staff, e.g. Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities
 Data processing and computer support
 Reliability and quality assurance
 Centerwide security and protection
 Fire protection
 Custodial services
 Logistics support including transportation, supplies, etc.
 Medical care of employees
 Photographic and graphic support

PERSONNEL AND RELATED COST

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1979 <u>Budget Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>1,792</u>	1,910	2,714	2,823

Basis of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Permanent Positions	1,567	1,705	2,387	2,484
b. Nonpermanent	34	23	62	62
c. Overtime and compensation	<u>8</u>	<u>6</u>	<u>7</u>	<u>7</u>

Subtotal, Compensation	1,609	1,734	2,456	2,553
------------------------------	-------	-------	-------	-------

2. <u>Benefits</u>	<u>163</u>	<u>169</u>	<u>242</u>	<u>254</u>
---------------------------	------------	------------	------------	------------

Subtotal, Compensation and Benefits... ..	<u>1,772</u>	<u>1,903</u>	<u>2,698</u>	<u>2,807</u>
---	--------------	--------------	--------------	--------------

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1979 <u>Budget</u> <u>Estimate</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	15	4	11	11
2. Personnel training	<u>5</u>	<u>3</u>	<u>5</u>	<u>5</u>
Subtotal, Supporting Costs.....	20	7	16	16
Total, Personnel and Related Costs.....	<u>1,792</u>	<u>1,910</u>	<u>2,714</u>	<u>2,823</u>
A. <u>Compensation and Benefits</u>	<u>1,772</u>	<u>1,903</u>	<u>2,698</u>	<u>2,807</u>
1. Compensation	<u>1,609</u>	<u>1,734</u>	<u>2,456</u>	<u>2,553</u>
a. Permanent positions	1,567	1,705	2,387	2,484

The current estimate for 1978 increased from the 1978 budget estimate as a result of the assignment of the Earth Resources Laboratory as a component of the National Space Technology Laboratories and the October 1977 pay increase. The 1979 estimate is increased as shown below:

Basis of Cost for Permanent Positions

In 1979 the cost of permanent positions will be \$2,484 thousand, an increase of \$109 thousand from 1978. The increase results from the following:

Cost of permanent positions in 1978.....	2,387
Cost increase in 1979.....	+119
Within grade advances and career development	
Full year effect of 1978 actions.....	+29
Partial year effect of 1979 actions.....	+18
Full year effect of October 1977 pay increase.....	+3
Full year effect of 1978 personnel increase.....	+48
Partial year effect of 1979 personnel increase.....	+21

Cost of decreases in 1979..	-22
Turnover savings and abolished positions	
Full year effect of 1978 actions.....	-6
Partial year effect of 1979 actions.....	-16
Cost of permanent positions in 1979.....	<u>2,484</u>

	1977 Actual	1978 <u>Budget Estimate</u> <u>Current Estimate</u>		1979 <u>Budget Estimate</u>
		(Thousands of Dollars)		

b. Nonpermanent positions

1. Cost.....	34	23	62	62
2. Workyears	3	2	7	7

The increase from the 1978 budget estimate to the 1978 current estimate is a result of the assignment of the Earth Resources Laboratory as a component of the National Space Technology Laboratories. The 1979 estimate will support the following programs at the levels indicated below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.....	4
Youth opportunity programs.....	2
Other temporary employment	<u>1</u>
Total.	<u>7</u>

c. Overtime and other compensation	8	6	7	7
--	---	---	---	---

The 1979 overtime estimate is necessary to meet management and administrative requirements in such areas as procurement and financial management.

2. <u>Benefits</u>	<u>163</u>	<u>169</u>	<u>242</u>	<u>254</u>
--------------------------	------------	------------	------------	------------

The following table reflects the personnel benefits by major category:

Category of Costs	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands	<u>Current Estimate</u> of Dollars)	
Civil Service Retirement Fund	117	121	174	183
Employee life insurance	8	8	13	14
Employee health insurance.....	33	38	49	51
FICA... ..	1	---	1	1
Incentive awards.....	<u>4</u>	<u>2</u>	<u>5</u>	<u>5</u>
Total.....	<u>163</u>	<u>169</u>	<u>242</u>	<u>254</u>

The increase from the 1978 budget estimate to the 1978 current estimate is a result of the assignment of Earth Resources Laboratory as a component of National Space Technology Laboratories. The increase from the 1978 current estimate to 1979 is due to the full year effect of the October 1977 pay increase and an increase in the NSTL staff of four positions.

B. <u>Supporting Costs</u>	<u>20</u>	<u>7</u>	<u>16</u>	<u>16</u>
1. Transfer of personnel	15	4	11	11

The amount estimated for 1979 is required to cover the planned personnel turnover and is based on the 1977 experience.

2. Personnel training	5	3	5	5
-----------------------------	---	---	---	---

The personnel training costs are primarily for "Upward Mobility" training for women and minorities, and EEO "Counsel Training".

TRAVEL

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
II. <u>TRAVEL</u>	<u>48</u>	<u>32</u>	<u>50</u>	<u>65</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel...	13	4	23	33
B. Management and Operations Travel..	<u>35</u>	<u>28</u>	<u>27</u>	<u>32</u>
Total, Travel.	<u>48</u>	<u>32</u>	<u>50</u>	<u>65</u>
A. <u>Program Travel</u> ..	<u>13</u>	<u>4</u>	<u>23</u>	<u>33</u>

Program travel requirements are directly related to the accomplishment of the Center's mission, and will mainly be in support of the Space and Terrestrial Applications Office. The increase from the 1978 budget estimate to the 1978 current estimate is to support the Earth Resources Laboratory. The increase in 1979 reflects an increase in travel costs due to the expansion of the Regional Applications program activity.

B. <u>Management and Operations Travel</u>	<u>35</u>	<u>28</u>	<u>27</u>	<u>32</u>
--	-----------	-----------	-----------	-----------

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, **and procurement activities**; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. The increase in 1979 is primarily attributable to travel **involving management matters** concerning the newly assigned Earth Resources Laboratory.

FACILITIES SERVICES

The National Space Technology Laboratories (NSTL) covers 138,807 acres of grounds and a complex of facilities which are made of laboratories, office, and rocket engine test facilities.

The complex encompasses some 1,000,000 gross square feet of building space including seven major buildings. Also included are five major technical facilities. This physical plant supports an average daily on-Center population of 1,500 to 1,700 personnel. Many of the test facilities are utilized on schedules involving more than one shift and/or frequently during off-peak hours.

	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
III. <u>FACILITIES SERVICES</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>350</u>
<u>Basis of Fund Requirement</u>				
A. <u>Maintenance and Related Services</u>				
1. Facilities..	<u>---</u>	<u>---</u>	<u>---</u>	<u>100</u>
Subtotal.....	<u>---</u>	<u>---</u>	<u>---</u>	<u>100</u>
B. <u>Custodial Services</u> ..	<u>---</u>	<u>---</u>	<u>---</u>	<u>250</u>
Total, Facilities Services.....	<u>---</u>	<u>---</u>	<u>---</u>	<u>350</u>
A. <u>Maintenance and Related Services</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>100</u>
1. Facilities..	<u>---</u>	<u>---</u>	<u>---</u>	<u>100</u>
Provides modifications and alterations of facilities for normal recurring movements of personnel and equipment of the Earth Resources Laboratory.				
B. <u>Custodial Services</u> ...	<u>---</u>	<u>---</u>	<u>---</u>	<u>250</u>
Provides security guard services, janitorial services and fire protection to the Earth Resources Laboratory personnel by the National Space Technology Laboratories institutional support services contractor.				

TECHNICAL SERVICES

	1977 Actual	1978		1979 Budget
		Budget <u>Estimate</u>	Current <u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
IV. <u>TECHNICAL SERVICES</u>	---	---	---	50
Basis of Fund Requirements				
A. Automatic Data Processing				
1. Operations	---	---	---	35
Subtotal	---	---	---	35
B. <u>Scientific and Technical Information</u>				
1. Library	---	---	---	15
Subtotal.... ..	---	---	---	15
Total, Technical Services.. ..	---	---	---	50
A. Automatic Data Processing	---	---	---	35
Provides for the supplies, materials and software programs in support of the Earth Resources Laboratory.				
B. <u>Scientific and Technical Information</u>	---	---	---	15
Provides for the books, periodicals and other technical reports required by the Earth Resources Laboratory.				

MANAGEMENT AND OPERATIONS

	<u>1977</u> <u>Actual</u>	<u>1978</u> <u>Budget</u> <u>Estimate</u> (Thousands	<u>Current</u> <u>Estimate</u> of Dollars)	<u>1979</u> <u>Budget</u> <u>Estimate</u>
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>200</u>
<u>Basis of Fund Requirement</u>				
A, Administrative Communications.. ..	---	---	---	35
B. Printing and Reproduction	---	---	---	45
C. Transportation.	---	---	---	35
D. Installation Common Services.....	<u>---</u>	<u>---</u>	<u>---</u>	<u>85</u>
Total, Management and Operations	<u>---</u>	<u>---</u>	<u>---</u>	<u>200</u>
 A. <u>Administrative Communications</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>35</u>
Provides for the local telephone service for the Earth Resources Laboratory.				
 B. <u>Administrative Printing</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>45</u>
Provides for printing and reproduction services in support of the Earth Resources Laboratory personnel.				
 C. <u>Transportation</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>35</u>
Provides for the rental of the GSA vehicles required to support the operations of the Earth Resources Laboratory.				
 D. <u>Installation Common Services</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>85</u>
Provides medical services, supplies, materials and equipment for the Earth Resources Laboratory.				

	<u>1977</u> <u>Actual</u>	<u>1978</u> <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>1979</u> <u>Budget</u> <u>Estimate</u>
1. Medical services....				35
Provides for the physical examinations and emergency medical service.				
2. Installation support services.				50
Provides for the common administrative supplies, materials and equipment.				

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NATIONAL SPACE TECHNOLOGY LABORATORIES

NSL SUMMARY

	<u>FY 78</u>	<u>FY 79</u>
Excepted	1	1
GS-16	1	1
GS-15	4	4
GS-14	10	10
All other GS	<u>84</u>	<u>88</u>
TOTAL PERMANENT	100	104

OFFICE OF THE MANAGER

	<u>FY 78</u>	<u>FY 79</u>
Excepted	1	1
GS-16	1	1
All other GS	<u>2</u>	<u>2</u>
TOTAL PERMANENT	4	4

CHIEF COUNSEL

	<u>FY 78</u>	<u>FY 79</u>
GS-15	1	1
All other GS	<u>-</u>	<u>-</u>
TOTAL PERMANENT	1	1

EXECUTIVE STAFF

	<u>FY 78</u>	<u>FY 79</u>
GS-14	-	-
All other GS	<u>7</u>	<u>7</u>
TOTAL PERMANENT	7	7

**RESOURCES & FINANCIAL
MANAGEMENT OFFICE**

	<u>FY 78</u>	<u>FY 79</u>
GS-14	1	1
All other GS	<u>16</u>	<u>16</u>
TOTAL PERMANENT	17	17

**PROCUREMENT & CONTRACTS
OFFICE**

	<u>FY 78</u>	<u>FY 79</u>
GS-14	1	1
All other GS	<u>10</u>	<u>10</u>
TOTAL PERMANENT	11	11

**FACILITIES ENGINEERING
OFFICE**

	<u>FY 78</u>	<u>FY 79</u>
GS-14	1	1
All other GS	<u>8</u>	<u>9</u>
TOTAL PERMANENT	9	10

**INSTALLATIONS OPERATIONS
OFFICE**

	<u>FY 78</u>	<u>FY 79</u>
GS-14	2	2
All other GS	<u>11</u>	<u>12</u>
TOTAL PERMANENT	13	14

**EARTH RESOURCES
LABORATORY**

	<u>FY 78</u>	<u>FY 79</u>
GS-15	3	3
GS-14	5	5
All other GS	<u>30</u>	<u>32</u>
TOTAL PERMANENT	38	40

NASA

LEGEND

- Interstate Highways
- U.S. Highways
- State Highways
- Railroads
- Commercial Airports
- General Aviation
- Military Airfields
- Commercial Ports
- Deep Water Ports
- Colleges & Universities
- Urban Areas

NSTL	
FEE AREA	13,480 ACRES
BUFFER ZONE	125,327 "
TOTAL	138,807 "

NATIONAL SPACE TECHNOLOGY LABORATORIES

SLIDELL COMPUTER COMPLEX

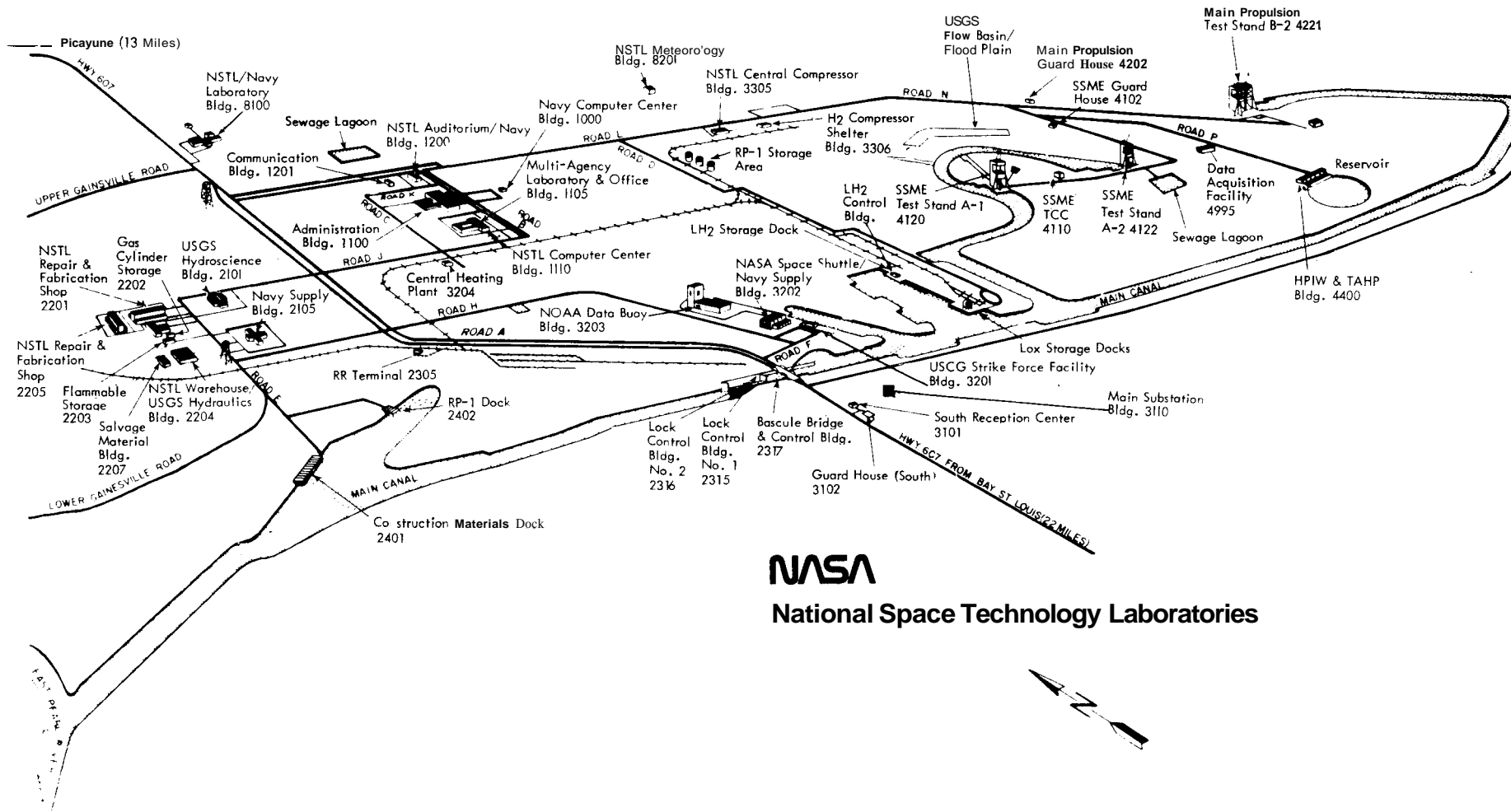
MICHOUD ASSEMBLY FACILITY

National Space Technology Laboratories

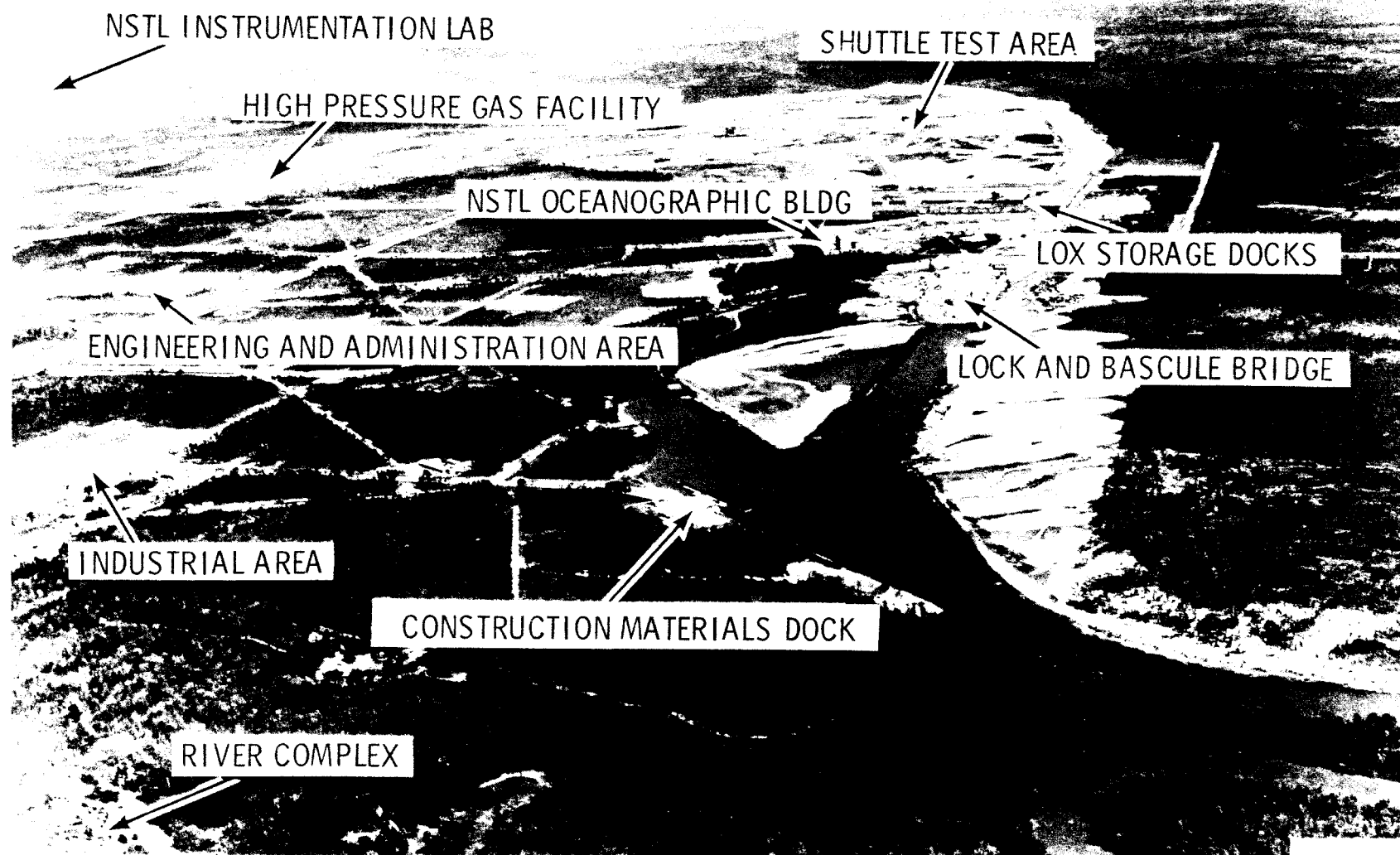
REGIONAL MAP



NSTL LOCATION PLAN



NATIONAL SPACE TECHNOLOGY LABORATORIES-AERIAL VIEW



RESEARCH AND PROGRAM MANAGEMENT

FISCAL, YEAR 1979 ESTIMATES

GODDARD SPACE FLIGHT CENTER

DESCRIPTION

The Goddard Space Flight Center, located 15 miles northeast of Washington, DC., at Greenbelt, Maryland, is situated on a 554-acre main site. Three additional nearby plots of 640 acres comprise the remote site area and contain the Goddard Antenna Test Range, the Goddard Optical Facility, the Propulsion Research Facility, the Magnetic Fields Component Test Facility, the Attitude Control Test Facility, and the Network Training and Test Facility. The total capital investment for the Goddard Space Flight Center, including tracking stations and contractor-held facilities at various locations as of September 30, 1977, was \$467,950,000.

The majority of the Goddard Center's personnel are located at Greenbelt, Maryland; other personnel are located at the Goddard Institute for Space Studies in New York City, and throughout the world, managing the operation of satellite tracking and communications network stations.

CENTER ROLES AND MISSIONS

The Goddard Space Flight Center, established in 1959 as the first major United States installation devoted to the investigation and exploration of space, conducts a wide-ranging program in space science and applications. The Goddard Center has developed many diverse capabilities: the management of complex projects; the development of wholly integrated spacecraft, ranging from systems engineering to development, integration, and testing; the development and operation of satellite tracking networks, data acquisition and analysis; and scientific research to include both theoretical studies and the development of many significant scientific experiments flown on satellites. The principal and supporting roles are:

PRINCIPAL

Earth Orbital Spacecraft Development and Flight Operations - for science and applications, includes spacecraft propulsion and supporting technology such as low cost structural evaluation and reliability demonstration, advanced guidance systems and space power systems. Major emphasis is on automated, standard spacecraft systems, free flyers, experiment integration, and the planning and conducting of associated flight operations.

Tracking and Data Acquisition Systems and Support Operations - planning, developing and implementing the tracking network, data processing and analysis, communications, and mission control systems and facilities. Planning and conducting support earth orbit spacecraft. Includes flight control, tracking, data acquisition, communications, and information processing and analysis. Network planning and implementation support for Shuttle, including Orbital Flight Tests (OFT). (Tracking and data acquisition responsibilities include orbital phase acquisition of all mission types such as manned, deep space, etc.).

Spacelab Payloads - development, integration and data processing for Spacelab payloads in astrophysics, solar terrestrial physics, astronomy, and assigned applications roles.

Space Physics and Astronomy Payloads and Science - developing the technical discipline base, including astronomical sensors, developing and implementing flight experiments, including space physics and experimentation for planetary missions. (Includes planetary astronomy).

Upper Atmospheric Research - develop and apply analytical techniques, evaluate advanced instrumentation concepts for atmospheric constituent analysis.

Applications Research and Development - developing the technical discipline base, developing spaceborne sensors, developing ground data processing systems and data analysis systems, and implementing applications experiments for Weather and Climate, Earth Dynamics, Earth Resources and Communications.

Information Systems Technology - developing and maintaining a technology base.

Sounding Rocket Development, Procurement and Operations - developing and procuring sounding rockets and carrying out all phases of operations from mission/flight planning to landing and recovery. Includes supporting systems (i.e., guidance, telemetry and attitude control), payload carrier development, development acquisition. (Most GSFC sounding rocket activities involve the higher performance, more complex vehicle support systems. Most activities involving lower performance vehicle systems are assigned to Wallops Flight Center (WFC)).

Launch Vehicle Procurement - for science and applications-oriented missions. Current focus on sounding rockets and Delta.

SUPPORTING

Planetary Science - developing and applying techniques for the analysis of planetary atmospheres.

Contributing to the technical discipline base, developing spaceborne sensors and implementing experiments in:

- Environmental Monitoring
- Ocean Dynamics

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1979 <u>Budget</u> <u>Estimate</u>
I. Personnel and Related Costs.....	97,121	97,696	103,861	104,343
II. Travel.....	2,253	2,251	2,296	2,476
III. Facilities Services... ..	8,660	8,667	8,979	9,895
IV. Technical Services.....	2,457	2,182	1,999	2,046
V. Management and Operations.....	4,383	5,337	5,112	5,379
Total, fund requirements.....	<u>114.874</u>	<u>116.133</u>	<u>122.247</u>	<u>124.139</u>

Distribution of Permanent Positions by Program

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u>	1978 <u>Current Estimate</u>	1979 <u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>125</u>	<u>143</u>	<u>135</u>	<u>126</u>
Space shuttle.....	36	31	40	47
Space flight operations.....	1	16	10	10
Expendable launch vehicles.....	88	96	85	69
<u>Space Sciences</u>	<u>1.165</u>	<u>991</u>	<u>1.080</u>	<u>1.066</u>
Physics and astronomy.....	1.071	919	1.025	1.013
Lunar and planetary exploration.....	94	72	55	53
<u>Space and Terrestrial Applications</u>	<u>783</u>	<u>790</u>	<u>814</u>	<u>836</u>
Space applications.....	774	781	805	826
Technology utilization.....	9	9	9	10
<u>Aeronautics and Space Technology</u>	<u>59</u>	<u>77</u>	<u>59</u>	<u>64</u>
Space research and technology.....	58	76	58	64
Energy technology applications.....	1	1	1	---
<u>Tracking and Data Acquisition</u>	<u>655</u>	<u>674</u>	<u>615</u>	<u>612</u>
Subtotal Direct.....	2.787	2.675	2.703	2.704
<u>Center Management and Operations Support Positions</u>	<u>838</u>	<u>950</u>	<u>845</u>	<u>844</u>
Total. permanent positions.....	<u>3.625</u>	<u>3.625</u>	<u>3.548</u>	<u>3.548</u>

PROGRAM DESCRIPTION

SPACE SHUTTLE

47 Permanent Positions (Civil Service)

The objective of the Space Shuttle activities at Goddard Space Flight Center is to plan and implement the equipment systems, communications data, voice circuits, and operational procedures required for support during the Orbital Flight Test phases, and subsequent operational phases of the Shuttle program.

SPACE FLIGHT OPERATIONS

10 Permanent Positions (Civil Service)

The objective of the Goddard activities in this area is to provide the technical support and data to effectively integrate Goddard free-flyer payloads into the Space Transportation System. During 1979, Goddard will perform a variety of studies, utilizing Goddard's scientific and technical base, to better develop the Shuttle Payload requirements and interface for the Goddard Free-Flyer Payloads.

EXPENDABLE LAUNCH VEHICLES

69 Permanent Positions (Civil Service)

The Goddard Space Flight Center is the management center for the Delta launch vehicle. The Delta Vehicle is NASA's only medium class standard launch vehicle and has the capability of accurately putting a wide variety of spacecraft into a broad spectrum of orbits, ranging from equatorial to polar inclinations. The Delta is used for NASA missions and for a wide range of reimbursable missions for other government agencies, domestic commercial users, and international users. The Delta program is managed to provide for production of the launch vehicles required for approved missions, to provide the necessary operations support, to maintain production capability for projected missions and to provide for solid propellant upper stages and apogee booster motors for certain Delta and Atlas-Centaur/Titan-Centaur launches. The Delta project provides engineering, quality and configuration control services to maintain operational capability with high reliability.

PHYSICS AND ASTRONOMY

1,013 Permanent Positions (Civil Service)

Physics and Astronomy is comprised of research in three major areas: Astrophysics, Solar Terrestrial and Upper Atmospheric Research.

Goddard Astrophysics activities have the objectives of: accomplishing laboratory and flight scientific research to increase human knowledge of the earth's space environment, the stars, and the more distant heavenly bodies; and providing advanced technical development of experiments and spacecraft components for future astrophysics missions.

To this end, Goddard has organized its activities to accomplish scientific progress in all the following discipline areas of Astrophysics: Gamma Ray astronomy, X-ray astronomy, ultraviolet and optical astronomy, infrared and radio astronomy, and particle astrophysics. During 1979, work will be in progress on instruments to fly on the Space Telescope.

During 1979, Goddard will be actively engaged in the definition and development of astrophysics payloads for Spacelab missions and in the sounding rocket program, as well as many data analysis/interpretation tasks arising from the astrophysics satellites for which Goddard is responsible, including the Orbiting Astronomical Observatory and the International Ultraviolet Explorer.

The objective of the astrophysics payloads for the Spacelab is to evolve experiments which can capitalize on the unique capabilities of the Shuttle/Spacelab which will be used in connection with the Space Shuttle. The research areas under consideration include optical and ultraviolet astronomy and high energy astrophysics.

Goddard provides the management and support of the NASA national and international Sounding Rocket Program. The effort in 1979 also encompasses the Solar Pointing Aerobee Rocket Control System (SPARCS),

Goddard Solar Terrestrial activities have two historical objectives: to conduct laboratory and flight research to support and increase the human knowledge of the earth's space environment and the sun; and to provide the advanced technical expertise so that experiments and spacecraft components for future terrestrial missions may be developed.

In 1979, the majority of the efforts will be focused on two projects--the Solar Maximum Mission and the Spacelab solar terrestrial payloads.

The Solar Maximum Mission is designed to gather data which will lead to an understanding of the mechanisms and effects of solar flares. The SMM objectives are the continuation of investigations that were initiated through the Orbiting Solar Observatory and the Apollo Telescope Mount programs. During 1979, deliveries of the flight experiments will be concluded, and the satellite will be launched in late 1979.

The objective of the Spacelab solar terrestrial payloads project is to evolve solar terrestrial research in space using the Spacelab in conjunction with the Space Shuttle. During 1979, the development of scientific instruments and related hardware and software will continue, with the first flight planned for 1980.

The Goddard Space Flight Center provides expertise in the discipline of Upper Atmospheric Research. Goddard is pursuing research structured to obtain a scientific assessment of possible depletion of the earth's ozone layer and associated potential biological and climatic effects. This research is directed toward achieving an understanding of the physics and chemistry of the stratosphere and its adjoining regions by means of experimental measurements (aircraft, balloons, rockets, and satellites) as well as theoretical studies and laboratory measurements.

LUNAR AND PLANETARY EXPLOKATION

53 Permanent Positions (Civil Service)

The Goddard science activity within the Lunar and Planetary Program is designed to emphasize the physics of interplanetary space and planetary environments. To this end, Goddard will, in 1979, maintain as strong and viable a research group as is required to carry out this role.

During 1979, Goddard will be actively engaged in the support of two project activities--the Voyager mission and the Jupiter Orbiter Probe. For the Voyager mission the Goddard role will be one of analysis of the data gathered by the Goddard IRIS experiment and also participation by Goddard experimenters in the data analysis of the plasma science, radio astronomy, and cosmic ray experiments.

In 1979 the Jupiter Orbiter Probe will still be in the development stages and Goddard investigators will be active in monitoring progress on those experiments for which Goddard has been given responsibility. Activities will concentrate upon technology development, specification satisfaction, and completion of delivery schedules.

SPACE APPLICATIONS

826 Permanent Positions (Civil Service)

The Goddard Space Applications activities encompass broad roles and missions in the discipline areas of climate, weather, communications, earth resources, environmental monitoring, and earth and ocean dynamics. Goddard's activities fall into three **major** categories: (1) research and technology, (2) flight projects and (3) applications demonstrations.

In the area of applications research and technology, Goddard activities involve research and development directed toward the basic understanding and capabilities necessary to apply space systems and technology to practical uses on earth. Climate research activities are directed toward improved understanding of important physical processes related to climate such as cloud cover statistics, impact of aerosols and trace gases, ozone concentration trends and variability, solar effects, and refined albedo calculations. In 1979, efforts will continue on synthesis and analysis of satellite data collected during the 1970's into data sets for use in climate modeling, on the development of basic climate models, and on the assessment of user requirements for timely information from satellite data on the current state of the climate. In the weather area, a major activity will involve participation in the first GARP Global Experiment, a major cooperative international effort to obtain global data from satellites, ships, aircraft, balloons and other devices. Work will continue in severe storm research aimed at techniques and instruments for detection, prediction and warning of short-lived severe storms.

Environmental quality research and technology activity is directed toward the development of remote sensing technology and the analytic tools to interpret sensor measurements and assess the impact of pollution.

Communications activities involve advanced communications research, improved techniques for data management, and advanced flight experiment developments. Technology studies will be focused on the technology improvements required for applications in a public service communications satellite, e.g., small, simple ground-based antennas and transceivers with commensurate improvements in satellite power, beam shaping, and switching systems.

In Earth Resources, research and technology activities are directed toward improvement of data handling techniques, data processing equipment, machine-aided interpretation and classification techniques; and on definition and advanced development activities on potential future sensors to improve resources detection capabilities.

Ocean condition monitoring research involves such activities as determining mathematical models for prototype ocean circulation systems and developing methods for the monitoring of dynamic ocean surface phenomena.

Flight program activity includes design, development, operation and data analysis for Applications flight missions. The satellite systems involved are in all phases of the project cycle--some are in orbit returning data, some are well along in development and approaching launch, and some are in early phases of development. Among the NASA flight projects involved are the following:

- Landsat-C, scheduled for launch in 1978, will extend the period of space-data acquisition for earth resources initiated by LANDSAT-2, and improve the spectral observing capability, with the addition of an infrared channel. In addition to the spectral imagery, an improved Return Beam Vidicon system will provide high-resolution (40 meter) imagery.
- Landsat-D, scheduled for launch in 1981, will assess the capability of the Thematic Mapper, a powerful new instrument with much higher spatial resolution and greater spectral coverage than the multispectral scanner on the previous Landsat satellites; provide continuity of data to users of Landsat data; and provide a system level demonstration involving both space and ground data systems in cooperation with user agencies.
- Nimbus G, to be launched in 1978, will acquire environmental data on a global basis for atmospheric pollution and oceanography investigations.
- Stratospheric Aerosol and Gas Experiment, scheduled for launch in 1979, has the objectives of mapping of aerosols, ozone, and other gases on a global basis; tracking of aerosols since they act as tracers for circulation and transport phenomena; and determining the optical properties of aerosols and thus possibly assess their effects on global climate.
- Heat Capacity Mapping Mission, to be launched in 1978, has the primary objective of producing thermal maps of the surface of the earth, at the optimum times for thermal inertial measurements for discrimination of rock types and mineral resource location.
- Search and Rescue flight equipment will be launched on operational weather satellites during the 1982-1984 period to demonstrate the feasibility of improving detection and location-fixing of emergency distress signals from general aviation aircraft and marine vessels by the use of a satellite-based monitoring system.
- TIROS N, to be launched in 1978, will be the prototype spacecraft for the third generation operational environmental satellite system designed to provide an economical and stable platform for the advanced instruments to be used in making measurements of the earth's atmosphere, its surface and cloud cover and the proton and electron flux near the earth.
- Earth Radiation Budget Satellite System, to be launched in 1982, will contribute to the national climate research program by acquiring valuable data on the energy exchange between the Earth's atmosphere and space, on global and regional fluctuations in this energy exchange, and on other atmospheric factors important to climate research efforts.

In addition to the NASA flight projects, Goddard has management responsibility for the National Oceanographic and Atmospheric Administration satellites through launch and orbital checkout.

Applications demonstration activities involve the analysis, distribution and use of applicable data received from satellite systems. In 1979, activities in this area will include the use of data from Nimbus-G for solution of problems concerning pollution, ocean resources and dynamics, and weather and climate. Analysis and data use activities involving Landsat-C, the Heat Capacity Mapping Mission, the Magnetic Field Satellite, the Stratospheric Aerosol and Gas Experiment and other operating satellites will also be conducted during 1979. An active Regional Applications Transfer activity will be in progress in 1979 to transfer capabilities to personnel from user organizations. Also in 1979, because of the unique Goddard position relative to communications satellite systems, center personnel will support the U.S. government participation in the World Administrative Radio Conference at which policies, technical parameters, standards, design criteria and operational procedures will be established for space and terrestrial radio communications.

TECHNOLOGY UTILIZATION

10 Permanent Positions (Civil Service)

At Goddard, Technology Utilization activities are directed toward the application of space technology to public and private sector needs. Foremost among the technology applications projects in 1979 are the following:

1. Development of a demonstration model of a human tissue stimulator.
2. Development of a speech decoder for communication with the deaf.
3. Demonstration of a small, high capacity tape recorder in ocean bottom seismometers.
4. Demonstration of improved EKG techniques through the application of flight spectroscopy principles.

SPACE RESEARCH AND TECHNOLOGY

64 Permanent Positions (Civil Service)

The objective of the Goddard Space Flight Center in Space Research and Technology program activities is to provide results appropriate to space mission capability enhancement. Past efforts have produced many worthwhile advances in space system capacity, reliability and effectiveness. During 1979, areas of increasing attention include cryogenics for space flight, information systems and sensors. Also in 1979, Goddard Space Flight Center will begin work on the systems technology phase of the NASA End-to-End Data System (NEEDS).

TRACKING AND DATA ACQUISITION

612 Permanent Positions (Civil Service)

The Tracking and Data Acquisition Program at Goddard is broken into two main areas: (1) operation of the Spaceflight Tracking and Data Network (STDN) and Operational Communications Network (NASCOM) and, (2) information processing and computation support for flight projects.

The Spaceflight Tracking and Data Network (STDN) is operated in direct support of NASA's earth orbiting scientific and applications satellites and manned spaceflight programs. In addition, NASA authorizes the Network to provide services to satellites that are operated by other Government agencies, such as DOD and NOAA, as well as to spaceflight programs of foreign governments. Launch support by the STDN is provided to all of the above agencies and to commercial companies who fly earth orbiting satellites.

During 1979, the STDN must meet the widely varying requirements for support of ~~some~~ 50 missions including: Space Shuttle orbital test flight, LANDSAT, High Energy Astronomy Observatories, Nimbus, Tiros-N, SEASAT, International Sun Earth Explorer, Solar Maximum Mission, MAGSAT, Heat Capacity Mapping Mission, and Stratospheric Aerosol Gas Experiment.

NASA Communications Network (NASCOM) provides all operational communications required by NASA. Facilities of this Network link the stations of the STDN and will, in 1980, link together the Tracking and Data Relay Satellite System (TDRSS) to operate as a part of the overall tracking and data acquisition complex for which NASA has responsibility.

The Network will provide the operational interface between the Project users and the TDRSS.

Mission and Data Operation Support consists of mission analysis, mission operations, and planning support for all space flight programs utilizing the GSFC Mission Operations and Control facilities.

During the 1979 period emphasis will be placed upon the development of the following areas:

- End-to-end data systems which will transfer the sensor observations (data) from the spacecraft to the user with little or no auxiliary data reductions.
- Computational support of flight missions in the operation phase, utilizing only periodic verification of satellite execution/performance and command/program update by ground support.

Relative to the Space Shuttle, in 1979 Mission and Data Operations Support will be provided in the **following** areas:

- Completion of system definition, design, and systems implementations/operation for the non-time critical Spacelab data.
- Formulation of an operation plan to support the free flying satellites when detached from the Shuttle/STS.
- Completion of the Baseline Operations Plan for the Shuttle area.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

844 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or services being provided to all Goddard Space Flight Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and immediate staff, Staff Organizations, e.g., Legal, Patent Counsel, Equal Opportunity, Planning and Analysis, Public Affairs, and Safety.

Management Support - Includes a wide range of activities generally categorized as activities of a general and administrative nature which are required to operate and maintain the installation. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and **analysis**.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities
 Data processing and computer support
 Reliability and quality assurance
 Centerwide security and protection
 Fire protection
 Custodial services
 Logistics support including transportation, supplies, etc.
 Medical care of employees
 Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>97,121</u>	<u>97,696</u>	<u>103,861</u>	<u>104,343</u>

Basis of Fund Reauirements

A. Compensation and Benefits

1. Compensation

a. Permanent positions	87,090	86,815	92,548	93,060
b. Nonpermanent	661	898	799	850
c. Overtime and other compensation	<u>605</u>	<u>770</u>	<u>751</u>	<u>751</u>
Subtotal, Compensation	88,356	88,483	94,098	94,661

2. <u>Benefits</u>	<u>7,978</u>	<u>8,561</u>	<u>9,028</u>	<u>8,904</u>
Subtotal, Compensation and Benefits.....	<u>96,334</u>	<u>97,044</u>	<u>103,126</u>	<u>103,565</u>

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	123	106	142	145
2. Personnel training.....	<u>664</u>	<u>546</u>	<u>593</u>	633
Subtotal, Supporting Costs.....	<u>787</u>	<u>652</u>	<u>735</u>	<u>778</u>
Total, Personnel and Related Costs.....	<u>97,121</u>	<u>97,696</u>	<u>103,861</u>	<u>104,343</u>
A. <u>Compensation and Benefits</u>	<u>96,334</u>	<u>97,044</u>	<u>103,126</u>	<u>103,565</u>
1. <u>Compensation</u>	<u>88,356</u>	<u>88,483</u>	<u>94,098</u>	<u>94,661</u>
a. Permanent positions.	87,090	86,815	92,548	93,060

Basis of Cost for Permanent Positions - FY 1979

The estimate for permanent compensation (starting from prior year cost) is based upon the position structure at the start of the year, as modified by the addition of new positions and the abolishment of existing positions, within grade advances, career development, and the pay increases. After these modifications, the year-end position structure is established and the cost effect for the year is calculated based on the estimated period that these modifications are in effect:

Cost of permanent positions in FY 1978.....	92,548
Cost increases in 1979.....	+2,248
Within grade advances and career development:	
Full year effect of 1978 actions.....	+944
Partial year effect of 1979 actions.....	+922
Full year effect of 1978 pay increases.....	+116
Change - reimbursables.....	+266

Cost decreases in 1979.. -1,736
 Turnover savings and abolished positions:
 Full year effect of 1978 actions.. -1,127
 Partial year effect of 1979 actions..... -609
 Cost of permanent positions in 1979..... . 93,060

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> (Thousands of Dollars)	Current <u>Estimate</u>	1979 <u>Budget Estimate</u>
b. Nonpermanent positions				
1. cost.....	661	898	799	850
2. Work years.....	83	101	99	106

The 1979 budget estimate reflects the full-year effect of the 1978 pay raises and will support the following programs at approximately the levels indicated below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.	40
Summer programs..	15
Youth opportunity programs....	28
Other temporary employment	<u>23</u>
Total.	<u>106</u>

c. Overtime and other compensation.	605	770	751	751
--	-----	-----	-----	-----

Overtime at Goddard is required to meet peak operational requirements where additional hours of work are essential, generally culminating in the launch of a spacecraft. Some of the areas involved are fabrication, experimentation, testing, launching and tracking of the spacecraft. The level of effort in 1979 is the same as 1978.

	1977 <u>Actual</u>	1978		1979
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. Benefits.. .. .	<u>7,978</u>	<u>8,561</u>	<u>9,028</u>	<u>8,904</u>

The increase from the 1978 budget to current estimate reflects the pay increases plus severance pay for a work force adjustment. The 1979 budget estimate also reflects the cost of the pay increase offset by the absence of severance pay.

The following table indicates the cost of personnel benefits by the major categories:

Category of Costs

Civil Service Retirement Fund.....	6,098	6,121	6,480	6,514
Employees life insurance.....	306	363	360	391
Employees health insurance.....	1,370	1,819	1,631	1,749
Workmen's compensation....	61	92	92	92
FICA.....	18	19	21	23
Incentive awards.....	99	86	116	126
Other benefits.....	7	61	8	9
Severance pay... ..	<u>19</u>	<u>---</u>	<u>320</u>	<u>---</u>
Total.....	<u>7,978</u>	<u>8,561</u>	<u>9,028</u>	<u>8,904</u>

B. <u>Supporting Costs.</u> .. .	<u>787</u>	<u>652</u>	<u>735</u>	<u>778</u>
1. Transfer of personnel.	123	106	142	145

The category includes the reimbursement to employees of movements of household goods to the employees new duty station and other relocation expenses. The increase in 1978 from the budget estimate to the current estimate reflects 1977 experience. 1979 is planned at the 1978 level.

2. Personnel training.	664	546	593	633
-----------------------------	-----	-----	-----	-----

The personnel training costs are based on continuation of current training programs and the need to re-orient skills of employees into areas compatible with the direction of the current space program and Goddard's role in the program. The increase in 1979 reflects the full year effect of tuition cost increases.

TRAVEL

	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
11. <u>T-VEL</u>	<u>2,253</u>	<u>2,251</u>	<u>2,296</u>	<u>2,476</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel....	1,905	1,874	1,941	2,095
B. Scientific and Technical Development.....	212	209	215	232
C. Management and Operations Travel.	<u>136</u>	<u>168</u>	140	149
Total, Travel....	<u>2,253</u>	<u>2,251</u>	<u>2,296</u>	<u>2,476</u>
A. <u>Program Travel</u>	<u>1,905</u>	<u>1,874</u>	<u>1,941</u>	<u>2,095</u>

Program travel is essential to the accomplishment of the Center's mission, particularly with regard to the Physics and Astronomy, Space and Terrestrial Applications, Tracking and Data Acquisition, and space flight disciplines. In these areas, efforts will be devoted to performing applications research, developing complex satellites and launch systems, managing data processing systems, and creating scientific instruments for further research. Travel to support Tracking and Data Acquisition, Physics and Astronomy, and Space Sciences is expected to continue in 1979 at approximately the same level experienced in 1978. However, travel required to support Space and Terrestrial Applications programs and the Expendable Launch Vehicles portion of the Space Transportation System will increase in 1979.

B. <u>Scientific and Technical Development</u>	<u>212</u>	<u>209</u>	215	<u>232</u>
--	------------	------------	-----	------------

Scientific and Technical Development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside GSFC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit

of the Government. Approximately 281 trips are planned in 1979 to attend scientific and technical meetings. Space and Terrestrial Applications Programs are the primary users of travel in this area. The level of travel in this category is expected to remain approximately the same as experienced in 1978.

	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
C. <u>Management and Operations Travel</u>	136	168	140	149

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities, travel of the Center's top management to NASA Headquarters and other NASA Centers, and local transportation. This travel is expected to remain at approximately the same level as 1978, with about 513 trips anticipated in 1979.

FACILITIES SERVICES

Goddard Space Flight Center (GSFC) is located on 554 acres of grounds with a complex of laboratory and office-type buildings as well as test facilities. This complex encompasses 2,700,000 gross square feet of building space including 17 major buildings. Also included are seven major technical facilities. This physical plant supports an average daily on-Center population of 5,800 to 6,100 Personnel. Many of the test facilities are utilized on schedules involving more than one shift and during off-peak hours.

III. <u>FACILITIES SERVICES</u>	<u>8,660</u>	<u>8,667</u>	<u>8,979</u>	<u>9,895</u>
<u>Basis of Fund Reauirements</u>				
A. <u>Rental of Real Property</u>	780	<u>731</u>	<u>747</u>	<u>795</u>
B. <u>Maintenance and Related Services</u>				
1. Facilities.. ..	1,503	1,495	1,333	1,371
2. Equipment	<u>39</u>	<u>14</u>	<u>14</u>	<u>14</u>
Subtotal.	<u>1,542</u>	<u>1,509</u>	<u>1,347</u>	<u>1,385</u>

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
C. <u>Custodial Services</u>	<u>1,783</u>	<u>1,696</u>	<u>1,647</u>	<u>1,750</u>
D. <u>Utility Services</u>	<u>4,555</u>	<u>4,731</u>	<u>5,238</u>	<u>5,965</u>
Total, Facilities Services..	<u>8,660</u>	<u>8,667</u>	<u>8,979</u>	<u>9,895</u>
A. <u>Rental of Real Property</u>	780	<u>731</u>	<u>747</u>	795
<p>This provides space for personnel at certain tracking stations and the Goddard Institute of Space Sciences (GISS) in New York City, as well as storage and warehouse space for equipment, supplies and materials. The area requirements are about the same as those rented in 1978.</p>				
B. <u>Maintenance and Related Services</u>	<u>1,542</u>	<u>1,509</u>	<u>1,347</u>	<u>1,385</u>
1. Facilities...	1,503	1,495	1,333	1,371

This activity (60 workyears of effort) provides for the continuation of the same level of effort as in 1978. The increased funding in 1979 represents provision for negotiated support contractor wage rate increases. The major services included are:

a. Maintenance and operations 355

These funds provide general buildings maintenance including painting, inspection, and mechanical and electrical maintenance.

b. Ground maintenance..... 155

Seven workyears of effort provide mowing, cultivation, mulching, fertilizing and care of trees and shrubs.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

c. Supplies and facilities equipment..... 427

Included in this category are chemicals, building materials, electrical and electronic materials, general maintenance and operating materials, metals, pipes, valves, and fittings.

d. Routine facilities work..... 434

Included in this activity is support for rehabilitation and modification of facilities, office alteration and safety upgrading.

2. Equipment..... 39 14 14 14

Provides maintenance of the onsite radio communications network.

C. Custodial Services..... 1,783 1,696 1,647 1,750

This activity involves a total of 117 workyears of effort at GSFC to provide for:

1. Janitorial services (80 workyears of effort)..... 1,095

This activity is applicable to about 2.2 million square feet of area, and includes washing and relamping of light fixtures, trash removal (40-60 cubic yards per day) and minor laundry services.

2. Security guard services..... 655

This activity includes badging of all onsite personnel and visitors, vehicle identification, and protection of all government facilities and equipment including the GISS in New York City.

D. Utilities Services..... 4,555 4,731 5,238 5,965

The budget provides for operation and maintenance of the utility plant and distribution systems as well as the purchase of utility services, and supplies, materials and equipment required for the maintenance of these systems. Electricity is purchased from Potomac Gas and Electric Company, natural gas from Washington Gas Light

<u>1977</u> <u>Actual</u>	<u>1978</u>		<u>1979</u> <u>Budget</u> <u>Estimate</u>
	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	

Company and fuel oil from a local supplier. Water and sewage is provided by the Washington Suburban Sanitary Commission. Included is \$200,000 for utility system maintenance, \$305,000 for utilities provided to leased buildings, and \$5,460,000 for the purchase of utilities services as follows:

1. Electricity (94,000 MW/Hrs.)	4,382
2. Natural Gas (165,000 K cu. ft.)	429
3. Fuel Oil (1 million gals.)	450
4. Water and Sewage	199

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u>	<u>2,457</u>	<u>2,182</u>	<u>1,999</u>	<u>2,046</u>
-------------------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment	345	290	268	276
2. Operations	<u>1,013</u>	875	878	893
Subtotal....	<u>1,358</u>	<u>1,165</u>	<u>1,146</u>	1,169

B. Scientific and Technical Information

1. Library	580	563	523	553
2. Education and Information.	<u>223</u>	<u>203</u>	<u>117</u>	<u>102</u>
Subtotal.	<u>803</u>	<u>766</u>	<u>640</u>	<u>655</u>

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1979 <u>Budget Estimate</u>
C. Shop Support and Services.. .. .	296	251	213	222
Total, Technical Services.....	<u>2,457</u>	<u>2,182</u>	<u>1,999</u>	<u>2,046</u>
A. <u>Automatic Data Processing</u>	<u>1,358</u>	<u>1,165</u>	<u>1,146</u>	<u>1,169</u>

This funding provides accounting and management information to satisfy requirements of NASA and GSFC management. Included is support of GSFC business data functions.

1. Equipment	345	290	268	276
--------------------	-----	-----	-----	-----

The maintenance costs (112 thousand) of all GSFC-owned administrative ADP equipment and the lease costs (164 thousand) of all leased administrative ADP hardware are included in this estimate. Leased equipment includes Xerox 1200 printer, Sycor terminal system, various other terminals, and other peripheral equipment. Maintenance services are provided for the IBM 360/50 (main business computer), memory, disc drives, terminals, and associated equipment.

2. Operations	1,013	875	878	893
---------------------	-------	-----	-----	-----

The systems supported include Institutional Management, Financial and Accounting, Procurement, and Personnel Management.

a. Computer programming, keypunch operators, and other support personnel are provided for 36 workyears at a cost of 710 thousand.

b. Supplies, materials, and software programs are included as operational costs for provision of administrative ADP information. This is a continuation of the same level of effort as in 1978 at a cost of 183 thousand.

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> (Thousands of Dollars)		1979 <u>Budget Estimate</u>
B. <u>Scientific and Technical Information</u>	<u>803</u>	<u>766</u>	<u>640</u>	<u>655</u>

These funds provide for the operation of a technical library at GSFC, a public affairs educational and informational program, and support to the center in the provision of various scientific and technical information services.

1. Library	580	563	523	553
------------------	-----	-----	-----	-----

Cataloging, reference, acquisition, and translating services, and distribution of books and publications in the operation of the GSFC Library are funded in this estimate. This includes over 65,000 books, 45,000 journals, plus almost one million microfiche copies of aerospace documents. Higher subscription rates cause a small increase in the 1979 estimate.

2. Education and Information	223	203	117	102
------------------------------------	-----	-----	-----	-----

This estimate includes funds for exhibit management and refurbishment, spacemobile operation, demonstrational models, workshops and symposia, and educational and informational materials.

C. <u>Shop Support and Services</u>	<u>296</u>	<u>251</u>	<u>213</u>	<u>222</u>
---	------------	------------	------------	------------

Support is provided in the areas of safety, photo services, graphics, and publications. Fire protection system maintenance and related supplies and equipment; film and print processing, photographic supplies and repair of photographic equipment; art work services and related supply and equipment costs; and materials and equipment maintenance for compilation of documents comprise this category. The level of funding for 1979 is essentially unchanged from 1978.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>4.383</u>	<u>5.337</u>	<u>5.112</u>	<u>5.379</u>
-------------------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
A. Administrative Communications	2,302	2,329	2,331	2,475
B. Printing and Reproduction.....	375	463	351	384
C. Transportation.	628	1,532	1,534	1,652
D. Installation Common Services..	<u>1,078</u>	<u>1,013</u>	<u>896</u>	<u>868</u>
Total, Management and Operations.....	<u>4,383</u>	<u>5,337</u>	<u>5,112</u>	<u>5,379</u>
 A. <u>Administrative Communications.....</u>	 <u>2,302</u>	 <u>2,329</u>	 <u>2,331</u>	 <u>2,475</u>

Provides for local telephone service, long distance telephone service, and other non-telephone communications. The same level of support is projected for 1979 as in 1978 and the increase in cost reflects the full year effect of current rates.

1. Local telephone services..... 1,187

Covers 3,600 PBX internal lines and 5,800 telephone instruments at GSFC; there are 13 tie-lines for Baltimore-area communications. An additional 225 General Services Administration (GSA) centrex lines are used for computer data operations.

2. Long distance telephone service..... 1,014

a. Federal Telecommunications System use will approximate 700,000 calls in 1979, at a level based on the 1977 actual.

b. Tolls or commercial long distance costs are included.

1977 Actual	1978 Budget <u>Estimate</u> (Thousands of Dollars)	1978 Current <u>Estimate</u> (Thousands of Dollars)	1979 Budget <u>Estimate</u>
----------------	---	--	-----------------------------------

3. Non-Telephone Communications.				274
---------------------------------------	--	--	--	-----

a. Postage.

b. Teletype costs including the GSA Automatic Records System (ARS).

c. Also included is a United Press International Wire Service for the Public Affairs Office.

B. <u>Printing and Reproduction</u>	<u>375</u>	<u>463</u>	351	<u>384</u>
---	------------	------------	-----	------------

This estimate provides the funding for an onsite printing plant operated by GSFC personnel. This printing plant produces approximately 17,000,000 units of printing each year. In addition to this onsite printing plant, GSFC must also purchase from private firms under Government Printing Office contract, about 30,000,000 units of printing each year. This purchased printing is a combination of an overflow requirement that cannot be handled because of the onsite workload and items that cannot be handled with the onsite equipment. Types of printing accomplished by offsite private firms are multiple-copy forms, multicolor work, and forms for computer use. The increase in 1979 relates to higher rates for commercial printing.

C. Transportation	<u>628</u>	<u>1,532</u>	<u>1,534</u>	<u>1,652</u>
-------------------------	------------	--------------	--------------	--------------

Involves 51 workyears of support contractor effort for operation of Center transportation and storage areas, and other miscellaneous services. Also included are supplies and equipment for vehicle maintenance, gasoline, contracted services for vehicle maintenance, and special vehicle rental. The 1979 increase is caused by the full year effect of negotiated support contractor-wage rates.

1. Contractor support

a. Operation of Transportation Center--33 workyears for drivers, dispatchers, supervisory personnel; provide pickup and delivery of purchased items and stock items, mail delivery, shuttle transportation, issuance of motor pool vehicles.

b. Packing and crating--one workyear for preparing shipments.

- c. Rigging--three workyears for rigging equipment for relocation on the Center for shipment elsewhere.
- d. Tape storage--six workyears to operate central magnetic tape depository.
- e. Storage and warehousing--seven workyears to operate receiving areas for supplies, stock issuances, and warehousing and storage function.
- f. Moving and hauling--one workyear for moving equipment and furniture on emergency basis.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
D. <u>Installation Common Services</u>	<u>1,078</u>	<u>1,013</u>	<u>896</u>	<u>868</u>

Supports Center Management and staff activities, provides medical services, and covers various installation support services. The 1979 level of effort remains about the same as in 1978.

- 1. Center management and staff..... 209

Includes patent searches and applications; steno services, handbook revisions, EEO programs; and general administrative supplies, materials, equipment, and equipment maintenance (microfilm, copiers, special typewriters) for staff offices.

- 2. Medical Services..... 514

Provides support in Occupational Medicine and Environmental Health. Fifteen support contractor work-years are required for onsite support.

- a. Occupational medicine.. 391

This activity consists of operation of the GSFC onsite health unit and medical services for Goddard Institute of Space Sciences (GISS) employees in New York. Twelve workyears provide emergency care onsite, annual physical exams for GSFC employees, fitness programs, immunizations, and counseling. Annual physical exams are provided for approximately 3,400 employees at the Center. The necessary supplies, materials and equipment for operation of the health unit are included.

b. Environmental health..... 123

Environmental health consists of industrial hygiene and an environmental health lab at a total of three workyears for detection and correction of health hazards. Necessary supplies, materials, and equipment are included.

3. Installation support services..... 145

This estimate includes all administrative support items not specifically identified elsewhere. Among these are the purchase of office furniture and operating supplies issued from stock; maintenance of all center labor-saving devices; and materials for mailroom and warehouse operation.

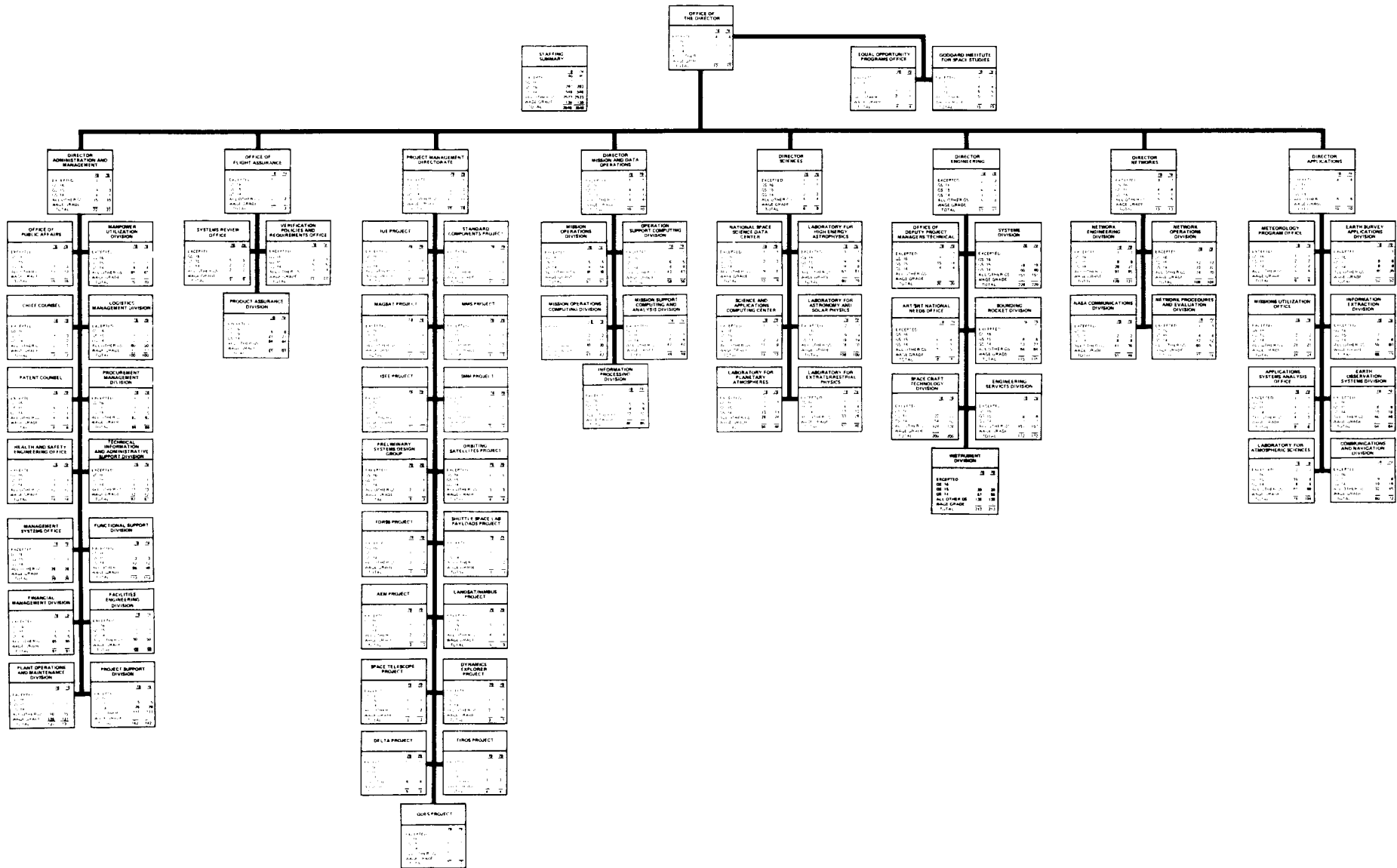
a. Office supplies..... 70

General office supplies, furniture, and operating supplies for warehouse and mailroom, such as pallets and gas cylinders are included in this estimate.

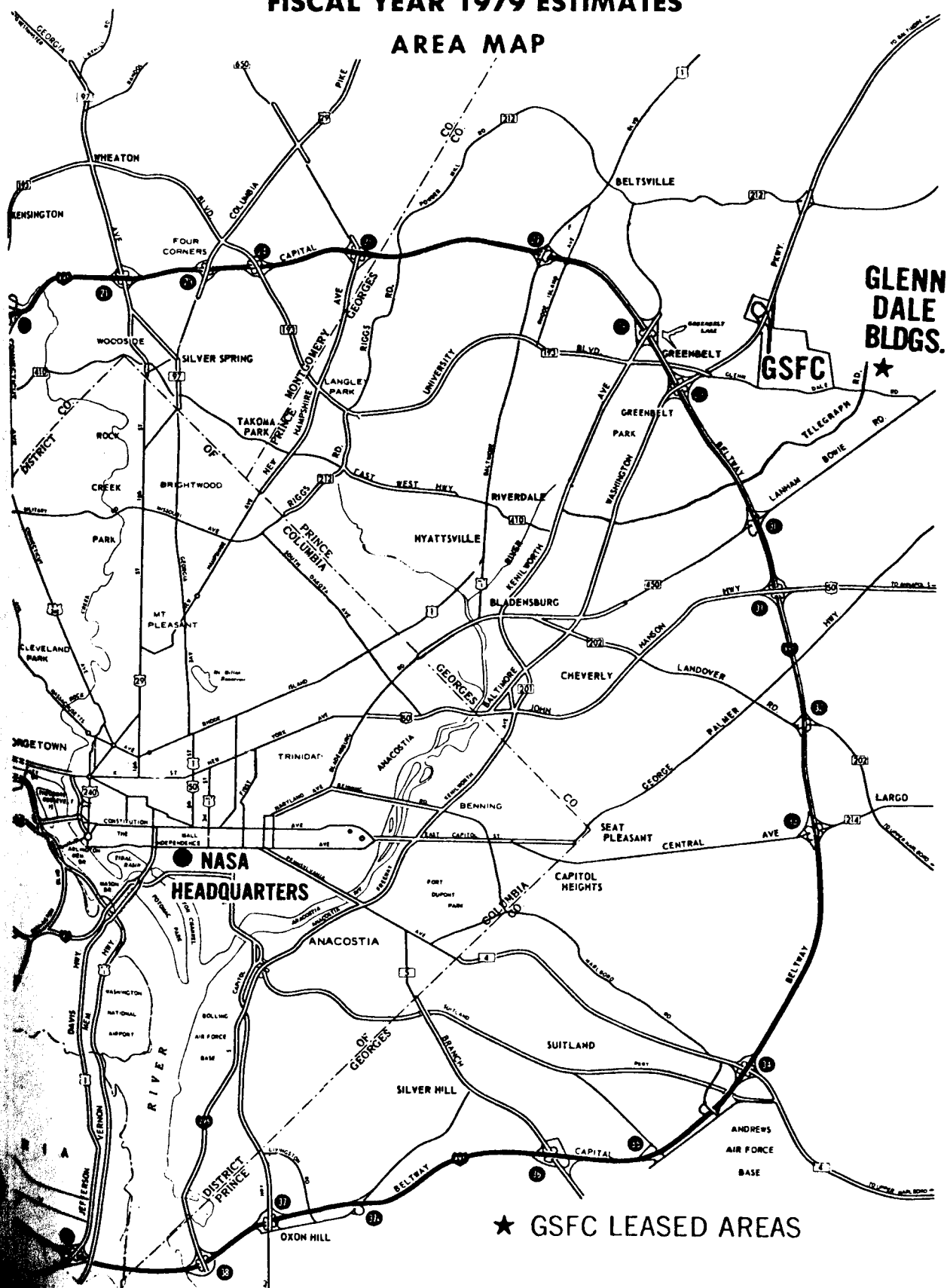
b. Maintenance of general administrative equipment..... 75

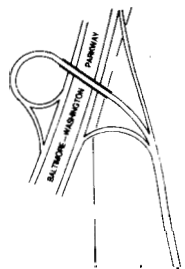
This funding provides maintenance of copiers, time stamps, electronic calculators, electric typewriters, calculators, and adding machines; as well as cylinder and electric file maintenance.

**GODDARD SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING SUMMARY**

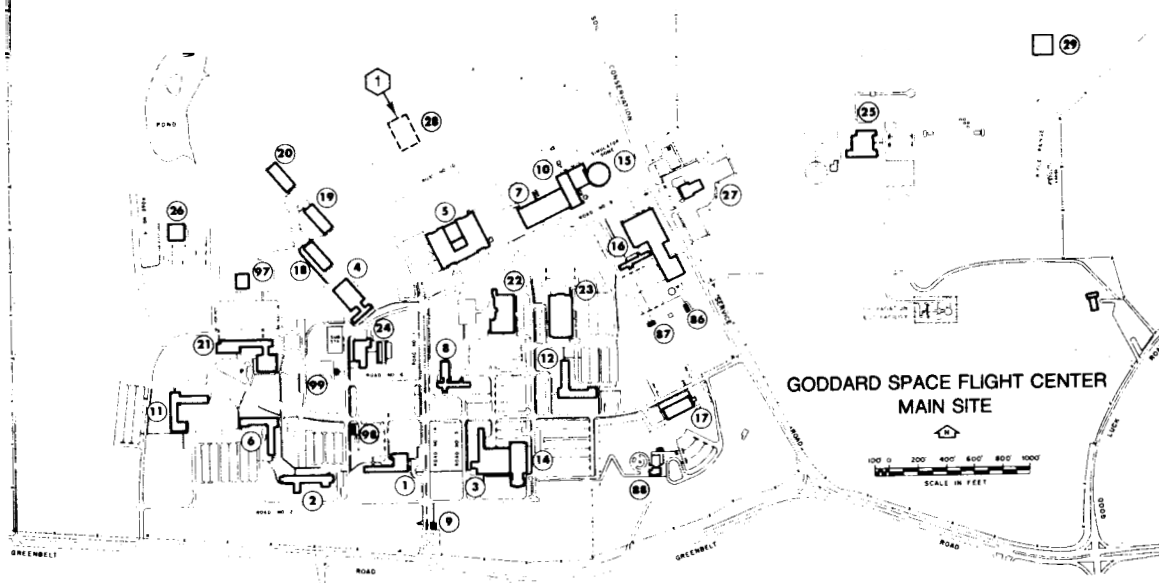


RPM 5-29



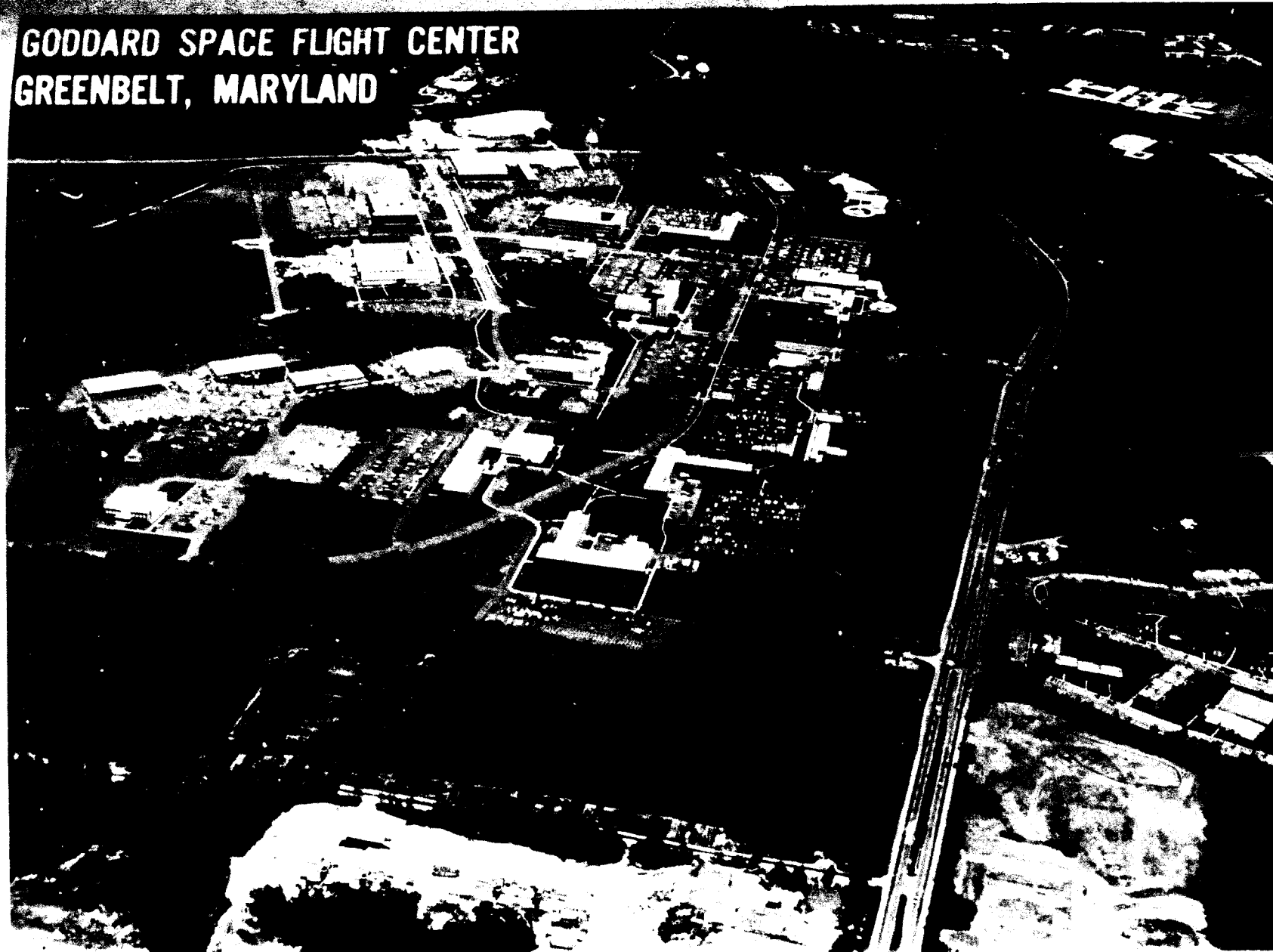


GODDARD SPACE FLIGHT CENTER FISCAL YEAR 1979 ESTIMATES LOCATION PLAN



- 1 SPACE PROJECTS BUILDING
- 2 RESEARCH PROJECTS LABORATORY
- 3 CENTRAL FLIGHT CONTROL & RANGE OPERATIONS BUILDING
- 4 GENERAL PURPOSE FACILITY BUILDING
- 5 INSTRUMENT CONSTRUCTION & INSTALLATION LABORATORY
- 6 SPACE SCIENCES LABORATORY
- 7 PAYLOAD TESTING FACILITY
- 8 SATELLITE SYSTEMS BUILDING
- 9 MAIN GATE HOUSE
- 10 ENVIRONMENTAL TESTING LABORATORY
- 11 APPLIED SCIENCES LABORATORY
- 12 TRACKING & TELEMETRY LABORATORY
- 14 SPACECRAFT OPERATIONS FACILITY
- 15 LAUNCH PHASE SIMULATOR
- 16 DEVELOPMENT OPERATIONS BUILDING
- 17 MULTI-PURPOSE BUILDING
- 18 BUSINESS OPERATIONS BUILDING
- 19 MULTI-PURPOSE BUILDING
- 20 GEOCHEMISTRY BUILDING
- 21 METEOROLOGICAL SYSTEMS DEVELOPMENT LABORATORY
- 22 MECHANICAL TEST FACILITY & QUALITY ASSURANCE LABORATORY
- 23 DATA INTERPRETATION LABORATORY
- 24 CENTRAL HEATING & REFRIGERATION PLANT
- 25 NETWORK TRAINING & TEST FACILITY
- 26 NASA SPACE SCIENCE DATACENTER
- 27 MOBILE EQUIPMENT SUPPORT FACILITY
- 28 LANDSAT TECHNICAL PROCESSING FACILITY
- 29 FREQUENCY STANDARD AND TEST FACILITY
- 86 DAY CARE CENTER BUILDING
- 87 GAS CYLINDER STORAGE BUILDING
- 88 VISITOR'S CENTER
- 97 PLANT MAINTENANCE SUPPORT FACILITY
- 98 GEWASTORE
- 99 NASA CAREER DEVELOPMENT CENTER

**GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND**



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

WALLOPS FLIGHT CENTER

DESCRIPTION

Wallops Flight Center includes three separate areas on the Atlantic Coast of Virginia's eastern shore: the main base, the Wallops Island launching site, and the Wallops mainland site. The administrative offices, range control center, support shops, and main telemetry buildings are located on the main base. Wallops Island is about seven miles southeast of the main base and is connected to the mainland by a causeway and bridge. The island is about five miles long and one-half mile wide at its widest point. Located on the island are rocket storage buildings, blockhouses, assembly shops and launch sites. The Wallops mainland site is a one-half mile strip west of the island which houses the radar and optical tracking sites.

Wallops Flight Center, totalling 6,166 acres, consists of 1,833 acres on the main base, 3,085 acres on Wallops Island, 108 acres on the mainland tracking site, and 1,140 acres of marsh land. The total capital investment, including fixed assets in progress and contractor-held facilities at various locations as of September 30, 1977, was \$133,930,000.

CENTER ROLES AND MISSIONS

Wallops Flight Center prepares, assembles, launches, and tracks space vehicles and acquires scientific information from them. Wallops also has developed, maintains, and operates a research airport in support of NASA's aeronautical research programs which include projects associated with airport-aircraft interface, air traffic control, avionics systems technology, final approach and landing systems, airport configuration, high speed turn-off techniques, airport environmental studies, noise reduction technology, and general aviation research focused on aircraft spin characteristics, cross-wind landings, pilot performance, and procedures and aides at uncontrolled airports and airspace. Its facilities are utilized by the scientists and engineers from the laboratories and research centers of NASA, other governmental agencies, colleges and universities, and the worldwide scientific community. Center personnel assist these scientific research teams with their projects and develop, as necessary, special types of instrumentation and equipment to complete the mission.

The principal and supporting roles are:

PRINCIPAL

Sounding Rocket Development, Procurement and Operations - developing and procuring sounding rockets and carrying out all phases of operations, from mission and flight planning to landing and recovery. Payload carrier development, telemetry, experiment management support to other institutions, launch operations and tracking and data acquisition are included.

Balloon Program - managing, monitoring, scheduling, and technical analysis of balloon activities conducted for the Office of Naval Research and the National Science Foundation.

SUPPORTING

Sounding Rocket Payload Carrier Development and Experiment Management Support - provided in the applications disciplines of Weather and Climate, and Earth and Ocean dynamics.

Aeronautical Flight Test Support - provide flight test support for Langley Research Center's aeronautical flight test programs, including tracking and data acquisition.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1977 Actual	1978 Budget Estimate (Thousands of Dollars)	1978 Current Estimate (Thousands of Dollars)	1979 Budget Estimate
I Personnel and Related Costs.....	9,408	8,913	10 197	10 313
II Travel.....	290	283	241	348
III Facilities Services.....	2 385	2,094	2,702	2 959
IV. Technical Services.....	260	228	237	449
V Management and Operations.....	7	1,107	1	1
Total, fund requirements.....	<u>13,268</u>	<u>14,226</u>	<u>14,539</u>	<u>15,205</u>

Distribution of Permanent Positions by Program

	<u>1977</u> <u>Actual</u>	<u>1978</u> <u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>1979</u> <u>Budget</u> <u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems....</u>	<u>4</u>	<u>4</u>	4	<u>6</u>
Space flight operations... ..	---	---	---	2
Expendable launch vehicles.. ..	4	4	4	4
<u>Space Sciences.....</u>	<u>64</u>	<u>58</u>	<u>66</u>	67
Physics and astronomy.....	64	58	66	67
<u>Space and Terrestrial Applications.....</u>	<u>54</u>	<u>60</u>	<u>46</u>	<u>45</u>
Space applications.. ..	53	59	45	44
Technology utilization.....	1	1	1	1
<u>Aeronautics and Space Technology.....</u>	<u>27</u>	<u>21</u>	<u>30</u>	<u>27</u>
Aeronautical research and technology.....	27	21	30	27
<u>Tracking and Data Acquisition.....</u>	96	<u>99</u>	<u>97</u>	98
Subtotal, direct positions	245	242	243	243
<u>Center Management and Operations Support Positions.....</u>	<u>165</u>	<u>171</u>	<u>165</u>	<u>165</u>
Total, permanent positions	<u>410</u>	<u>413</u>	<u>408</u>	<u>408</u>

PROGRAM DESCRIPTION

SPACE FLIGHT OPERATIONS

2 Permanent Positions (Civil Service)

In 1979, the Civil Service personnel will provide mission and range safety support for Space Shuttle launches. Wallops Flight Center tracking activities will also support Space Shuttle missions during the orbital phase.

EXPENDABLE LAUNCH VEHICLE

4 Permanent Positions (Civil Service)

These personnel provide for storage and inspection of SCOUT stages and provide processing, shipping and other services for all SCOUT vehicles launched from the San Marco platform maintained off the coast of Africa by the Italian Government. Many of these missions are joint United States/Italian efforts.

PHYSICS AND ASTRONOMY

67 Permanent Positions (Civil Service)

Sounding Rocket Program

The objective of this program is to support space research, using low cost sounding rockets, in the fields of Solar Physics, Galactic Astronomy, Fields and Particles, Ionospheric Physics, Stratospheric Composition, Aeronomy and Meteorology. Wallops Flight Center provides flight systems support, launch range support, and support to experiments utilizing sounding rockets.

In 1979, the Wallops Launch Range will provide launch activities and ground instrumentation support of the launches at Wallops Flight Center and at the Poker Flats Research Range near Fairbanks, Alaska, plus expedition type support to other areas. The Wallops Flight Center launch range is equipped with launchers capable of handling sounding rockets of all sizes. The Poker Flats Research Range is jointly supported by Wallops Flight Center and the Defense Nuclear Agency and has limited capability although its facilities can be supplemented by the mobile equipment from Wallops Flight Center.

Balloon Program

The objective of this program is to support space research, using low cost balloon platforms, in the fields of solar physics, Galactic Astronomy, Stratospheric Composition, Aeronomy and Meteorology.

In 1979, Wallops Flight Center will provide ground instrumentation support, technical, and flight hardware support to experimenters in the balloon program.

The majority of the flights are conducted from the National Scientific Balloon Facility site at Palestine, Texas, or the United States Air Force site at Holloman, New Mexico; however, some flights are supported from remote sites in the northern United States, Canada, Alaska, Australia, New Zealand, Argentina and Brazil.

SPACE APPLICATIONS

44 Permanent Positions (civil Service)

Weather and Climate

In 1979, the Wallops Flight Center civil service personnel will continue to conduct the Meteorological Rocket Network project. The objectives of this project are:

1. To investigate the processes which characterize the physical state of the strato-mesosphere region of the atmosphere and to determine interactions within this layer of the atmosphere and with the troposphere.
2. To provide data for climatology of the upper atmosphere.
3. To provide in-situ measurement data which are used to calibrate satellite remote sensors.

Through the Meteorological Rocket Networks project, Wallops Flight Center manages NASA's participation in the Cooperative Meteorological Rocket Network (CMRN), the Experimental Inter-American Meteorological Rocket Network (EXAMETNET) and the Eastern-Western Hemisphere Meteorological Rocket Network.

Earth and Ocean Dynamics

In Ocean Dynamics, where the primary emphasis is being placed, investigations in the broad areas of sea state measurement, surface currents, ocean topographical mapping, and their supporting ground truth, studies are in progress.

In 1979, the WFC civil service personnel will be involved in investigating the feasibility of determining ocean surface currents from satellites and aircraft measurement of the local surface wave structure; investigating the "sea state bias effect" in satellite altimetry to develop methods of correcting the error; determining the mean sea surface or geoid; evaluating and determining the inadequacies of existing predictive and descriptive synoptic ocean circulation models and investigating the impact of utilizing synoptic altimeter data as input to the models; and developing techniques of using altimeter pulse wave form data for the determination of sea state. Included in this area is WFC's work related to the operation of the SEASAT-A Radar Altimeter.

TECHNOLOGY UTILIZATION

1 permanent Position (Civil Service)

In 1979, the civil service personnel will carry out the Technology Utilization program at WFC, and be involved in (1) expediting application of new technology, (2) encouraging the use of NASA technology in other sectors, and (3) understanding more fully the technology transfer process and its impact.

AERONAUTICAL RESEARCH AND TECHNOLOGY

27 Permanent Positions (Civil Service)

In 1979, the Wallops Flight Center airport will be involved in conducting research tests of various aircraft and helicopters in the terminal area operating environment. Flight studies will be made of new approach and landing procedures utilizing the latest in guidance equipment and techniques, pilot information displays, vertical and short takeoff and landing flight vehicles, helicopter stabilization, terminal area navigation, and tests of other systems leading to automatic landing of aircraft. One runway has been modified to study the effect of runway grooving as a means of controlling aircraft hydroplaning on wet or slush-covered runways. Studies of automotive hydroplaning have also been conducted using this runway. The data acquired from the aircraft and automotive tests will ultimately assist in the development of safer, more flexible transportation systems.

TRACKING AND DATA ACQUISITION

98 Permanent Positions (Civil Service)

Tracking and data acquisition activities provide both fixed and mobile equipment for tracking, data acquisition, and communications. These activities will encompass the acquisition of new systems, modification and updating of existing systems and the operation, maintenance, and repair of these instrumentation systems. Included are highly precise instrumentation radars, analog and digital telemetry systems, precise range timing systems, range intercommunication systems, radio communication systems, tracking laser systems, digital data transmission systems, command and control systems, and digital data processing systems. These instrumentation systems are used in support of both aeronautical and rocket launched flight projects. These flight projects are conducted at Wallops Flight Center or at off-range locations in various parts of the world, depending upon the scientific experiment requirements. The sounding rocket programs supported at Wallops will cover all of the atmospheric and space disciplines in which research is undertaken, utilizing a family of launch vehicles varying in size and power from the small meteorological rockets to the 72-foot Scout with orbital capability. In 1979, more than 300 sounding rockets are to be launched from Wallops Island and remote sites around the world, carrying experiments in the fields of Aeronomy, Energetic Particles, Ionospheric Physics, Meteorology, and Solar Physics.

Of particular interest is the current effort to measure the effect of aerosols on the protective layer of ozone in the upper atmosphere which filters out harmful solar radiation.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

165 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as the support of services being provided to all Wallops Flight Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff

The Center Director, Deputy Director and the immediate staff, e.g. Legal, Patent Counsel, Equal Opportunity, Planning and Analysis, Public Affairs and Safety.

Management Support

Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support

This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Center-wide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1977 <u>Actual</u>	1978		1979
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>Budget</u> <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>9,406</u>	<u>9,913</u>	<u>10,197</u>	<u>10,313</u>
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	8,157	8,580	8,858	8,964
b. Nonpermanent	206	226	208	208
c. Overtime and other compensation.....	<u>123</u>	<u>163</u>	<u>157</u>	<u>157</u>
Subtotal, Compensation.....	8,486	8,969	9,223	9,329
2. Benefits.	<u>842</u>	<u>878</u>	<u>933</u>	<u>943</u>
Subtotal, Compensation and Benefits.....	<u>9,328</u>	<u>9,847</u>	<u>10,156</u>	<u>10,272</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	27	6	6	6
2. Personnel training.....	<u>51</u>	<u>60</u>	<u>35</u>	<u>35</u>
Subtotal, Supporting Costs.....	<u>78</u>	<u>66</u>	<u>41</u>	<u>41</u>
Total, Personnel and Related Costs.....	<u>9,406</u>	<u>9,913</u>	<u>10,197</u>	<u>10,313</u>

	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u>	<u>9,328</u>	<u>9,847</u>	<u>10,156</u>	<u>10,272</u>
1. <u>Compensation</u>	<u>8,486</u>	<u>8,969</u>	<u>9,223</u>	<u>9,329</u>
a. Permanent Positions.....	8,157	8,580	8,858	8,964

The funds shown above will support 408 permanent positions in 1979, the same level as 1978.

Basis of Cost for Permanent Positions

In 1978, the cost of permanent positions will be \$8,964,000. This increase results from the following calculation:

Cost of permanent positions in 1978.....	8,858
Cost increase in 1979.....	+20 1
Within grade advances and career development:	
Full year effect of 1978 actions.....	+79
Partial year effect of 1979 actions.....	+72
Full year effect of 1978 pay increases	+50
Cost decreases in 1979.....	-95
Turnover savings and abolished positions:	
Full year effect of 1978 actions	-52
Partial year effect of 1979 actions.....	-43
Cost of permanent positions in 1979.....	<u>8,964</u>

Other Compensation Costs

b. Nonpermanent positions

1. Cost.....	206	226	208	208
2. Workyears	29	33	29	29

The 1979 plan includes 29 workyears which is the same as 1978 and will support the following programs at the levels indicated below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.....	14
Summer employment.....	5
Opportunity programs.....	8
Other temporary employment.....	<u>2</u>
Total.....	<u>29</u>

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
c. Overtime and other compensation.....	123	163	157	157

Overtime funds are required at Wallops primarily to meet operational requirements of the sounding rocket programs of the Physics and Astronomy and Space Applications programs. Many factors beyond the Center's control, such as launch schedules, weather holds, and range clearance problems necessitate work beyond normal hours to operate the launch facilities, provide instrumentation support, and conduct tracking and data acquisition activities required to assure mission success.

2. <u>Benefits..</u>	<u>842</u>	<u>878</u>	<u>933</u>	943
----------------------------	------------	------------	------------	-----

Following are the amounts of contribution by category:

Category of Costs

Contribution to the Civil Service Retirement Fund....	579	630	630	636
Contribution for employee life insurance.	39	36	43	43
Contribution for employee health insurance.....	206	190	237	241
Workmen's Compensation	7	13	13	13

	1977 Actual	1978 Budget Estimate Current Estimate (Thousands of Dollars)		1979 Budget Estimate
Contribution to FICA.....	5	5	5	5
Incentive awards.....	2	1	2	2
Other benefits.....	<u>4</u>	3	<u>3</u>	3
Total... ..	<u>842</u>	<u>878</u>	<u>933</u>	<u>943</u>

The current estimate for 1978 is increased over the budget estimate because of the pay increases in 1978. The 1979 increase reflects the full year effect of higher rates for health insurance and increased retirement costs associated with increased compensation.

B. <u>Supporting Costs</u>	<u>78</u>	<u>66</u>	<u>41</u>	<u>41</u>
1. Transfer of personnel.	27	6	6	6

The transfer of personnel costs in 1978 and 1979 will cover the expenses for one permanent change of station move planned each year.

2. Personnel training	51	60	35	35
-----------------------------	----	----	----	----

The estimates for personnel training provide for costs of the Wallops Flight Center engineering technician apprentice program. Because of its remote location, Wallops historically has had difficulty recruiting qualified engineers and engineering technicians.

TRAVEL

II. <u>TRAVEL</u>	<u>290</u>	<u>283</u>	<u>241</u>	<u>348</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel.....	140	116	147	164
B. Scientific and Technical Development	36	42	41	46
C. Management and Operations Travel.....	<u>114</u>	<u>125</u>	<u>53</u>	<u>138</u>
Total, Travel.....	<u>290</u>	<u>283</u>	<u>241</u>	<u>348</u>

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

A. Program Travel 140 116 147 164

Program travel is directly related to the accomplishment of the Center's mission and reflects the continuing effort in the procurement and launch activities, the sounding rocket development program, the balloon program, and the aeronautical flight test program.

B. Scientific and Technical Development 36 42 41 46

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside WFC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government.

C. Management and Operations Travel 114 125 53 138

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. The increase in 1979 reflects the provision for a full twelve months funding on the intra-center transportation contract.

FACILITIES SERVICES

Wallops Flight Center involves 6,166 acres of grounds and a complex of facilities which mainly consist of research, airport, and launch operations facilities. This complex encompasses 1,040,000 gross square feet of building space including 3 major buildings. Also included are three major technical facilities. This physical plant supports an average daily on-Center population of 900 to 1,100 personnel housed on site. Many of the test facilities are utilized on schedules involving more than one shift and/or frequently during off-peak hours.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1979 <u>Budget</u> <u>Estimate</u>
111. <u>FACILITIES SERVICES</u>	<u>2.365</u>	<u>2.694</u>	<u>2.762</u>	<u>2.959</u>
<u>Basis of Fund Requirements</u>				
A. <u>Maintenance and Related Services</u>				
1. Facilities.	906	1,010	872	966
2. Equipment	<u>48</u>	<u>44</u>	<u>47</u>	<u>48</u>
Subtotal.....	954	1,054	919	1,014
B. <u>Custodial Services</u>	<u>391</u>	<u>495</u>	574	653
C. <u>Utility Services</u>	<u>1,020</u>	<u>1,145</u>	<u>1,269</u>	<u>1,292</u>
Total, Facilities Services.	<u>2.365</u>	<u>2,694</u>	<u>2,762</u>	<u>2.959</u>
A. <u>Maintenance and Related Services</u>	<u>954</u>	<u>1,054</u>	<u>919</u>	<u>1,014</u>
1. Facilities.....	906	1,010	872	966

This activity, requiring 36 workyears of effort, provides for the maintenance, repair and alteration of over 300 buildings and one million square feet of building space on 6,166 acres of land. The corrosive environment at Wallops Flight Center, caused by its proximity to the ocean, requires frequent maintenance and repair of exterior surfaces, roofing, utility distribution systems, mechanical doors, hardware and building equipment. The increase in 1979 over 1978 is for support contractor wage increases, and provides full year funding of previously negotiated contracts. Major types of support in this area are:

a. Ground maintenance 318

removal. Approximately 18 workyears provide for maintenance of lawns, trees and shrubs, and for snow

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Maintenance and operations.....				319
Eighteen workyears provide for the maintenance and operation of over 300 buildings.				
c. Supplies and equipment.....				329
Provides for the replacement of supplies and equipment necessary to the operation of the Wallops facility. The reduction in FY 1978 will be achieved by reducing stocks to a minimum. This effort will continue in 1979, as only a minor increase has been allowed to cover price increases.				
2. Equipment	48	44	47	48
Provides for the maintenance of miscellaneous equipment at the Center.				
B. <u>Custodial Services</u>	391	495	<u>574</u>	653
Provides for 43 workyears of support service contractor effort for janitorial services, firefighting and ambulance service, and plant security. Also provides for refuse removal, pest control and other miscellaneous services. The increases in 1978 and in 1979 result from rephasing of contractor funding and for contractor wage increases.				
1. Janitorial services.....				256
Twenty workyears provide for the cleaning of buildings.				
2. Firefighting and plant security				348
Twenty three workyears provide for firefighting, ambulance, and security guard service.				

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Miscellaneous</u>				49
Provides for refuse removal, pest control, laundry and other miscellaneous services.				
C. <u>Utilities</u>	1,020	1,145	1,269	1,292

The only purchased utilities at Wallops Flight Center are electricity, and fuel oil to operate the heating plant. This funding also provides for 10 workyears to operate and maintain the heating plant. The increase in 1979 is due to utility rate and support service contract increases.

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u>	<u>260</u>	<u>229</u>	<u>237</u>	<u>449</u>
-------------------------------------	------------	------------	------------	------------

Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment	10	10	10	11
2. Operations.	<u>67</u>	<u>53</u>	<u>69</u>	<u>69</u>
Subtotal.....~...~.....	<u>77</u>	<u>63</u>	<u>79</u>	<u>80</u>

B. Scientific and Technical Information

1. Library	98	104	102	108
2. Education and information.....	<u>25</u>	<u>22</u>	<u>18</u>	<u>223</u>
Subtotal.....	<u>123</u>	<u>126</u>	<u>120</u>	<u>331</u>

C. <u>Shop Support and Services</u>	<u>60</u>	<u>40</u>	<u>38</u>	<u>38</u>
Total, Technical Services....	<u>260</u>	<u>229</u>	<u>237</u>	<u>449</u>

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Automatic Data Processing</u>	77	63	79	80

Provides for administrative data processing including equipment maintenance, programming and operation. Seven workyears of support contractor effort are budgeted for this activity. The increase in 1979 is to provide for higher equipment maintenance cost.

1. Equipment 11

Provides for annual maintenance of remote terminals and peripheral equipment used for administrative data processing.

2. Operations 69

Seven workyears provide programming and operation of equipment used for processing of necessary business data such as payroll and other fiscal records, procurement, and personnel and supply data.

B. Scientific and Technical Information..... 123 126 120 331

Includes the purchases of books, supplies, and materials for, and the operation of the Wallops Flight Center Technical Library. It also provides for public information services, and for the exhibits, and operation of a visitor information center. The 1979 estimate provides for the new visitor information center.

1. Library. 108

Three workyears are used to operate the library. The procurement of books subscriptions, supplies and materials are also covered.

2. Education and ~~information~~..... 223

One workyear of support contractor effort is used to provide tour guide services for visitors. Provision is also made for the cost of exhibits and the operation of the soon to be constructed visitor information center at Wallops Flight Center, and for miscellaneous other public information services.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
C. <u>Shop Support and Services..</u>	<u>60</u>	<u>40</u>	<u>38</u>	<u>38</u>

Three workyears of support contractor effort will be used to provide engineering and fabrication support for facility planning and alteration.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>947</u>	<u>1,107</u>	<u>1,102</u>	<u>1,136</u>
---	------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Administrative Communications.....	99	160	144	149
B. Printing and Reproduction	33	67	73	75
C. Transportation	79	65	79	79
D. Installation Common Services.	<u>736</u>	<u>815</u>	<u>806</u>	<u>833</u>
Total, Management and Operations	<u>947</u>	<u>1,107</u>	<u>1,102</u>	<u>1,136</u>
A. <u>Administrative Communications</u>	<u>99</u>	<u>160</u>	<u>144</u>	149

Provides for the operation of the Wallops Flight Center's main switchboard and teletype facility, for the cost of leased lines and long distance tolls, postage, and for maintenance services. The 1979 estimate remains at the 1978 level.

1. Local telephone service.....	116
---------------------------------	-----

Six workyears are required to operate the Wallops Flight Center main switchboard and teletype facility. Provision is also made for maintenance and repair services.

	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
2. Long distance telephone service.....			6
Covers the cost of leased lines and long distance tolls.				
3. Non-telephone communications.....			27
Covers the cost of postage.				
B. <u>Printing and Reproduction</u>	<u>33</u>	<u>67</u>	<u>73</u>	<u>75</u>
Provides for five workyears of support service contractor effort to operate the printing and reproduction facility at Wallops Flight Center.				
C. <u>Transportation</u>	<u>79</u>	<u>65</u>	<u>79</u>	<u>79</u>
Includes the cost of commercial off-base services and repairs to the government owned motor vehicle fleet; the maintenance and repair of the Wallops Flight Center Queen Air aircraft; and the costs associated with the transportation of things.				
1. Transportation of things				2
Covers the cost of freight charges, and costs related to local moves, i.e., drayage and parcel post.				
2. Maintenance and repair of vehicles.				27
Provides for commercial services and repairs to the government owned motor vehicle fleet.				
3. Maintenance and repair of aircraft.....				50
Provides for approximately one workyear of contractor effort and for parts and supplies required to maintain the Wallops Flight Center Queen Air aircraft.				

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
D. <u>Installation Common Services</u>	736	815	806	833

Provides for medical services, rental of copying machines, supplies, materials, and equipment used for administrative purposes, and supply management and materials handling. The 1979 increase provides a full year funding for the medical services contract, and for a minor increase in rental of copying machines.

1. Medical services.....	20
--------------------------	----

Provides for the part-time services of a medical doctor's support of the Wallops Flight Center Occupational Health Program.

2. Machine rental.....	133
------------------------	-----

Covers the rental of copying equipment.

3. Supplies and equipment..	297
-----------------------------	-----

Provides for supplies, materials and equipment necessary to the administrative functions of Wallops Flight Center.

4. Supply management..	383
------------------------	-----

Twenty six workyears provide for moving and materials handling and operating the supply system at Wallops Flight Center.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART
Wallops Flight Center

STAFFING CHART

	<u>CY 78</u>	<u>BY 79</u>
Excepted	2	2
GS-16	1	1
GS-15	12	12
GS-14	29	29
All Other GS	323	323
Wage Grade	41	41
Total Permanent	408	408

DIRECTOR

	<u>CY</u>	<u>BY</u>
Excepted	2	2
GS-16	0	0
GS-15	3	3
GS-14	0	0
All Other GS	2	2
Wage Grade	0	0
Total Permanent	7	7

OPERATIONS DIRECTORATE

	<u>CY</u>	<u>BY</u>
Excepted	-	-
GS-16	-	-
GS-15	3	3
GS-14	6	6
All Other GS	107	107
Wage Grade	3	3
Total Permanent	119	119

ENGINEERING DIRECTORATE

	<u>CY</u>	<u>BY</u>
Excepted	-	-
GS-16	1	1
GS-15	4	4
GS-14	12	12
All Other GS	73	73
Wage Grade	0	0
Total Permanent	90	90

ADMINISTRATION DIRECTORATE

	<u>CY</u>	<u>BY</u>
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All Other GS	72	72
Wage Grade	0	0
Total Permanent	75	75

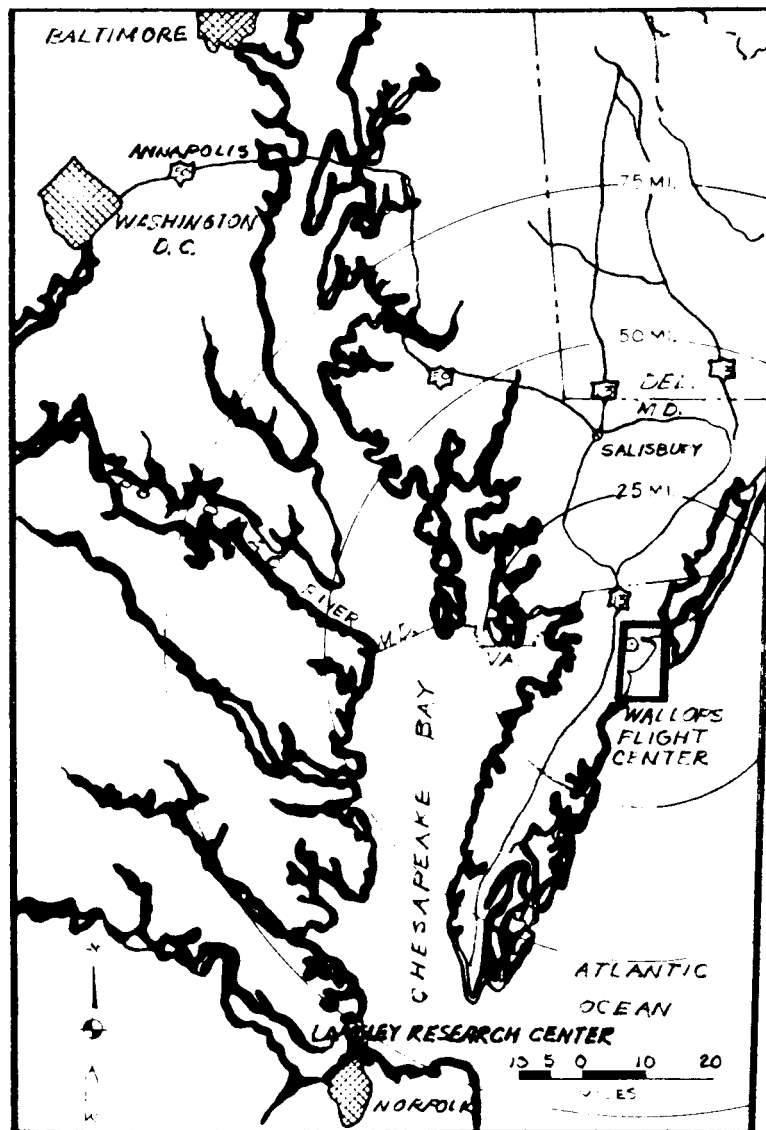
TECHNICAL SUPPORT DIRECTORATE

	<u>CY</u>	<u>BY</u>
Excepted	-	-
GS-16	-	-
GS-15	0	0
GS-14	1	1
All Other GS	60	60
Wage Grade	38	38
Total Permanent	99	99

APPLIED SCIENCE DIRECTORATE

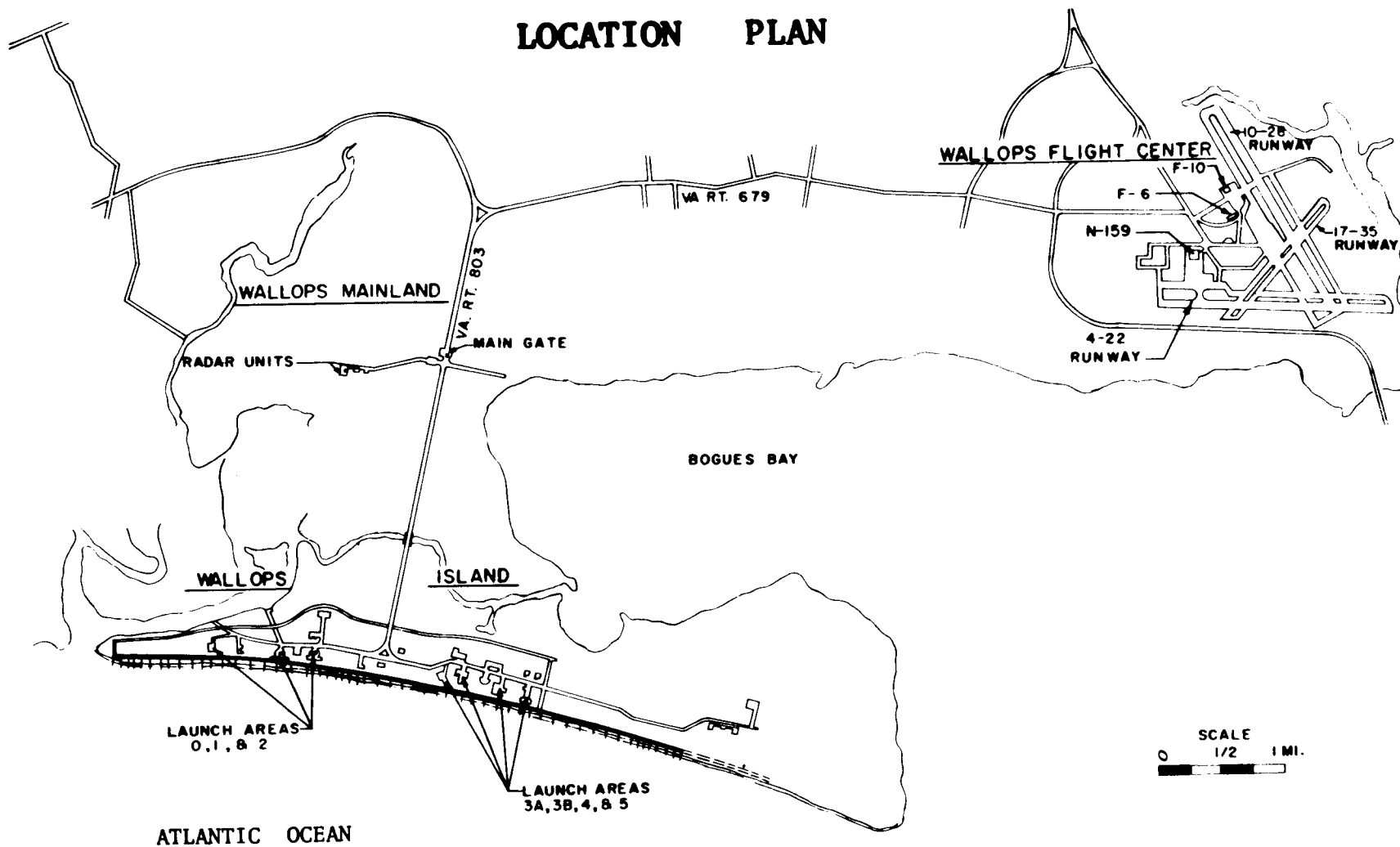
	<u>CY</u>	<u>BY</u>
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	8	8
All Other GS	9	9
Wage Grade	0	0
Total Permanent	18	18

—WALLOPS— FLIGHT CENTER LOCATION



WALLOPS FLIGHT CENTER

LOCATION PLAN





RPM 6-23



RPM 6-24



RPM 6-25

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

AMES RESEARCH CENTER

DESCRIPTION

The Ames Research Center (ARC) is located on 421 acres at the southern end of San Francisco Bay on land contiguous to the U.S. Naval Air Station, Moffett Field, California. Certain facilities, such as the utilities and airfield runways, are used jointly by NASA and the Department of the Navy. Also housed at the ARC is the U.S. Army Research and Technology Laboratory. Personnel from this laboratory work closely with Ames personnel on research of mutual interest. The capital investment at the ARC, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1977, was \$358,183,000.

CENTER ROLES AND MISSIONS

The programs at the Ames Research Center involve research and development in the fields of aeronautics, space science, life science, and space technology, as well as applications to national needs of the new science and technology growing out of the aerospace program. Specifically, the Center's major program responsibilities are concentrated in: short-haul aircraft technology, helicopter technology, flight simulation, computational fluid dynamics, planetary entry, airborne sciences and applications, and aeronautical and space life sciences. In addition to these major program responsibilities, the Center provides support for military programs, and various civil aviation projects. The principal and supporting roles are:

PRINCIPAL

Fundamental Aerodynamics - advancing the general state of the art, both theoretical and experimental

Short-Haul Aircraft Technology - developing a technology base for facilitating incorporation of short-haul aircraft into overall air transportation systems.

Helicopter Technology - developing a technology base for improving efficiency and flexibility for both civil and military use.

Computational Fluid Dynamics - furthering the state of the art through the definition of new systems, both hardware and software, and application to aeronautical and other related areas.

Flight Simulation - improving the state of the art to permit more effective use of simulators in aircraft design and validation-of-flight simulation.

Military Support - provision of technical support to military aviation in areas consistent with other ARC aeronautics roles and unique ARC capabilities.

Airborne Science and Applications - operating instrumented jet aircraft for the purpose of conducting airborne science and applications experiments.

Planetary Probes - developing thermoprotection systems required for planetary atmosphere entry probes and managing probe development.

Planetary Spacecraft Development and Mission Operations - completing the currently approved Pioneer series, including associated mission operations.

Life Sciences:

Human-Vehicle Interactions - furthering the state of the art through the study of man-machine and other human factor interactions and considerations involved in aircraft operations.

Biomedical Support Systems - developing advanced technology for development of long duration life support systems and protective systems.

Biological Experiments - developing, integrating and operating experiments for determining effects of space flight on (nonhuman) living organisms and for providing information applicable to solving space medicine problems.

Extraterrestrial Life Detection - developing and applying the analytical basis for life detection in space, including experiment design and management. Developing the technology to support the search for extraterrestrial intelligence with emphasis in the areas of sensor and end-to-end data management.

SUPPORTING

Space Transportation Passenger Selection Criteria - development and evaluation of medical criteria for noncrew passenger selection.

Astronomical Observation Techniques - focus on airborne science and the development of infrared techniques and supporting systems for use in Spacelab payloads.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	<u>1977</u> <u>Actual</u>	<u>1978</u>		<u>1979</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
I. Personnel and Related Costs.. .. .	44,825	44,197	48,506	49,377
II. Travel..... .	1,003	1,071	1,121	1,230
III. Facilities Services.... .	4,131	5,573	5,565	5,309
IV. Technical Services.. .. .	849	565	642	607
V. Management and Operations	<u>2,457</u>	<u>2,300</u>	<u>2,539</u>	<u>2,689</u>
Total, fund requirements	<u>53,265</u>	<u>53,706</u>	<u>58,373</u>	<u>59,212</u>

Distribution of Permanent Positions by Program

	<u>1977</u> <u>Actual</u>	<u>1978</u> <u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>1979</u> <u>Budget</u> <u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems..</u>	7	6	4	<u>3</u>
Space flight operations	7	6	4	3
<u>Space Sciences</u>	<u>373</u>	<u>379</u>	375	<u>369</u>
Physics and astronomy	101	100	105	102
Lunar and planetary exploration	122	135	123	116
Life sciences	150	144	147	151
<u>Space and Terrestrial Applications</u>	<u>79</u>	<u>58</u>	<u>72</u>	<u>75</u>
Space applications	71	50	67	69
Technology utilization.....	8	8	5	6
<u>Aeronautics and Space Technology</u>	<u>728</u>	749	<u>793</u>	<u>797</u>
Aeronautical research and technology	562	574	624	618
Space research and technology.	165	174	168	179
Energy technology applications.	<u>1</u>	<u>1</u>	<u>1</u>	<u>---</u>
Subtotal, direct positions	1,187	1,192	1,244	1,244
<u>Center Management and Operations Support Positions</u>	<u>426</u>	<u>409</u>	<u>433</u>	<u>433</u>
Total, permanent positions	<u>1,613</u>	<u>1,601</u>	<u>1,677</u>	<u>1,677</u>

PROGRAM DESCRIPTION

SPACE FLIGHT OPERATIONS

3 Permanent Positions (Civil Service)

The expertise developed by the Ames Research Center in its airborne science and applications role will be used to perform Shuttle/Spacelab simulations by using the CV 990 airborne laboratory and applying the simplified techniques developed for conducting airborne science missions with regard to 'experiment accommodation and operations. In addition, related studies to identify payload specialists training requirements and studies to define remote operations centers will be carried out.

PHYSICS AND ASTRONOMY

102 Permanent Positions (Civil Service)

Ames concentrates its physics and astronomy activities in the fields of infrared astronomy, taking the agency lead in this discipline, and in upper atmosphere research, focusing on stratospheric modeling and airborne measurements.

In 1979, the civil service personnel will provide support for the airborne astronomy program which includes a C-141 aircraft--the Kuiper Airborne Observatory (KAO)--as well as a Lear Jet aircraft, and measurements using selected instruments on the Ames U-2 aircraft. These aircraft are operated by Ames as flying astronomical observatories with the bulk of the observing accomplished by various University research teams. Ames supports these facilities with its in-house science competence and with its in-house capability to operate research aircraft.

Infrared astronomy observation from space platforms avoid obscuration caused by the Earth's atmosphere. Ames has responsibility for instruments to accomplish these observations including development of the telescope portion of the Infrared Astronomical Satellite (IRAS) and definition of an advanced instrument for use on Spacelab missions.

The Ames stratospheric research program is an integrated activity that blends the expertise of the Center and University scientists both in the development of computer models for the upper atmosphere and in the measurement of stratospheric constituents and properties from aircraft platforms. Computer modeling of the stratosphere is being performed at Ames to understand the unperturbed stratosphere and to predict the effects on the stratosphere of various pollutants, such as aircraft emissions and fluorocarbons, and of natural events such as the solar cycle and solar storms.

LUNAR AND PLANETARY EXPLORATION

116 Permanent Positions (Civil Service)

These civil service personnel are required in 1979 to accomplish the ongoing programs in support of agency goals in lunar and planetary exploration. This program consists of a continuing series of project management activities, backed by the scientific expertise of principal investigators from Ames, other NASA Centers and the University community. An in-house supporting research and technology program serves both to maintain the Center's scientific and technological expertise and to provide the stimulus and definition for new planetary missions.

In 1979 the civil service personnel will continue to provide project management and scientific support for: (1) Pioneers 6-9, a series of spacecraft exploring the physics of the interplanetary medium and providing ongoing data on the plasma in which the Earth is immersed; (2) Pioneers 10 and 11, two spacecraft that made close approaches to the planet Jupiter to study both the planet itself and the interaction of the solar wind with the planet's strong magnetic field (these spacecraft were then retargeted by being swung in the Jovian gravity field to explore completely unexplored regions of the solar system); (3) Pioneer Venus, scheduled for launch in 1978; and (4) the Jupiter Orbiter Probe (JOP) project, approved in 1978, a natural outgrowth of the Pioneer Venus atmospheric probes. Ames has responsibility for the Probe portion of this mission.

Ames researchers are playing key roles in all of these missions, and Ames scientists are responsible, as principal investigators, for measuring the characteristics of the solar wind in interplanetary space and near Jupiter; for measuring the atmospheric structure on Mars, Venus and Jupiter; for measuring atmospheric radiation balance on Venus and Jupiter; for measuring cloud characteristics on Venus and Jupiter, and for studying Mars for possible life-bearing soils and compounds. Ames researchers are also responsible for synthesizing atmospheric models for these planets that can be used to explain their current state and evolution and that can be applied in comparative studies *to* understand features of the Earth's weather and climate.

Ames principal investigators and their coworkers maintain an active program of laboratory and theoretical studies to develop basic atmospheric modeling concepts, to obtain the necessary physical data on a molecular scale to interpret the spacecraft observations, and to develop new and improved scientific measurements and instrument concepts for use on spacecraft. This program concentrates on planetary atmospheres, and has been particularly active in combining radiative transfer concepts with aerosol physics to obtain comprehensive planetary cloud and dust models.

LIFE SCIENCES

151 Permanent Positions (Civil Service)

In 1979, the civil service personnel will continue to be involved in research, hardware development, and program management related to meeting program milestones in the areas of understanding the effects of space flight on humans and other life forms; managing nonhuman biological experiments in space; developing advanced life support concepts and systems; and understanding the origin, evolution, and distribution of life and life-related chemicals on Earth and elsewhere in the universe. Examples of specific 1979 activities follow:

Space flight simulation studies will be conducted to determine whether 50- to 60-year-old male and female subjects can safely withstand the physiological stresses of Shuttle flights. The value of biofeedback training for minimizing space motion sickness symptoms will be intensively investigated.

Requirements for hardware for supporting nonhuman biological Spacelab experiments will be refined, and long lead-time items (e.g., animal cages with life support systems) will be designed in 1979. Proposed life sciences Spacelab experiments to be flown in the early 1980's will be reviewed and assessed for management schedule and cost impact.

Research and development of advanced air revitalization, water reclamation, and personal protective systems will be continued to meet the ultimate goal of highly efficient, reliable, lightweight, low volume, low power requirement life support systems for future manned space use.

Laboratory research, theoretical studies, and participation in the Pioneer-Venus mission will contribute toward the goals of developing scientific rationales and, in some cases, preliminary instrument design for possible future missions to Mars, Venus, and the outer planets; identifying specific mechanisms and pathways essential for the origin of life and early biological evolution; and proving the generality of the theory of chemical evolution. Ground-based simulations to support the results of the Viking missions will continue.

SPACE APPLICATIONS

69 Permanent Positions (Civil Service)

The Center provides a scientific capability in support of the Agency's Space Applications program.

A highly diversified group of scientifically capable people is required to support future programs in Earth Observations including space, atmospheric, and stratospheric programs; to provide skilled personnel and specialized airborne platforms in support of the Agency's applications satellite programs; to provide

skilled personnel to interpret and process both spaceborne and airborne remotely sensed data; to provide knowledgeable personnel to interact with and disseminate data and associated processing techniques to the user community.

The Center fulfills this role by: (1) conducting an active and continuing broad program of applied research and development to enhance the use of remote and in situ sensing technology for Earth resources applications and to transfer the ability to use this technology to a variety of Federal, State, regional, and local agencies; (2) working with these agencies to plan, initiate, and develop feasible and economical Earth resources sensing projects tailored to their specific needs; and (3) defining, developing, and evaluating potential satellite sensors, data acquisition and processing techniques, and associated communications technology. The Center controls a variety of operational aircraft, some of which serve as national and international facilities for research in astronomy, geophysics, meteorology, and Earth resources; others acquire data for remote sensing projects and provide a mechanism for integration of spaceborne, airborne, and ground-based data acquisition and processing systems.

In addition, this diversified scientific group: (1) provides management support to the Office of Space and Terrestrial Applications for the airborne instrumentation research program at Ames and other NASA Centers; and (2) provides a mechanism for implementation of applications transfer activities through the Western Regional Remote Sensing Applications Center. Both the high altitude (U-2) and medium altitude (CV-990) aircraft provides significant support to the LANDSAT (underflight data), Nimbus G (Ocean Color Scanner radiometer), Heat Capacity Mapping mission (Heat Capacity Mapping radiometer), and SEASAT (underflight data) satellite programs.

TECHNOLOGY UTILIZATION

6 Permanent Positions (Civil Service)

The Technology Utilization program at Ames is a community undertaking involving the part-time efforts of scientists and engineers in many disciplines and in many Center organizations working under the leadership and coordination of a small full-time Technology Utilization Office staff to move knowledge developed from the NASA programs to industry for effective use in the market place.

AERONAUTICAL RESEARCH AND TECHNOLOGY

618 Permanent Positions (Civil Service)

In 1979, the content of the Ames program in aeronautics is characterized in terms of three elements: Generic Research and Technology, Vehicle Specific Technology (Short-Haul), and aeronautical support to other agencies and to industry. These three elements form a coherent and interdependent program to meet

the Vertical Short Take-Off and Landing (VSTOL) and helicopter milestones of reduced aircraft noise, improved terminal area safety and efficiency and improved performance.

Generic Research and Technology:

The Generic Research and Technology program at Ames has as its principal focus in the areas of computational aerodynamics, experimental methods, avionics, and safety. The program is concentrated in the disciplines of aerodynamics and aeroelasticity, flight dynamics, guidance and control, and human factors. The program provides the fundamental disciplinary advances, both theoretical and experimental, that extend the state of the art. Substantial progress is anticipated in our ability to compute the theoretical behavior of aerodynamic and propulsive flows and to measure experimental aircraft configurational parameters. In 1979, research programs in flight dynamics will define the important interrelationships between vehicle dynamics, stability and control, and handling qualities in the regime of hover, and in transition from vertical to horizontal flight, for advanced VSTOL aircraft and rotorcraft. In guidance and control, the use of optimal control theory in conjunction with dynamic modeling of aircraft and ground-based guidance aids will provide new insight into the definition of air traffic control algorithms, particularly for the terminal area.

In 1979, the human factors program will provide the knowledge relevant to defining a more efficient aviation system through the better match of man and computer information transfer and decision making responsibility.

Vehicle Specific Technology Short-Haul:

The Vehicle Specific Technology at Ames is focused on short-haul aircraft, both civil and military; helicopter, VSTOL and Short-Range Conventional Take-Off and Landing (CTOL) aircraft. These aircraft have generally similar characteristics including: a dependence on propulsive lift (in addition to aerodynamic lift), a greater capability for versatile operations in the terminal area, and a greater degree of integration of man and machine. The vehicle technology emphasis at Ames relates to and depends on the basic capabilities and the aeronautical research disciplines described previously. In 1979, the aeromechanics portion of the program will include small-scale and large-scale wind tunnel testing of advanced rotor concepts and complete configuration modeling and ground-based simulation, and flight research utilizing a spectrum of vehicles acquired as part of the decision to consolidate full-scale hardware testing at Ames. This class of aircraft is dependent on high lift technology and low cost guidance and control systems, both of which are part of the ongoing program at ARC. The program includes wind tunnel and simulation investigations to achieve a significantly improved short-haul transport aircraft concept and compatible low cost avionics.

Other Agency and Industry Support:

The Ames Research Center has traditionally received requests from other agencies and from the industry for test support of their aircraft and systems development programs. The Navy and NASA have agreed to a comprehensive technical support program for the Navy VSTOL aircraft developments. The Army Research and Technology Laboratories of the U.S. Army Aviation Research and Development Command (AURADCOM) is located at Ames. The Aeromechanics Laboratory, the primary investigator of Army helicopter flight dynamics and controls, is also located at Ames, working both on independent R&D projects and with a staff integrated into the NASA organization on projects of joint interest. Extensive use is made of Ames aeronautical research facilities in these efforts. There are also a large number of joint programs with the Air Force Systems Command.

SPACE RESEARCH AND TECHNOLOGY

179 Permanent Positions (Civil Service)

In 1979, the number of civil service personnel requested will provide a Space Research and Technology program which encompasses both basic research and project support. The basic research focuses on entry technology and materials research. The project work supports Space Shuttle, Jupiter Orbiter Probe (JOP), Infrared Astronomical Satellite (IRAS) and the Orbiter Experiment program (OEX).

In 1979, the entry technology research will provide the aerothermodynamic data required for the design, development, and verification of planetary entry vehicles, and for computational fluid dynamic codes to predict space vehicle flow fields and performance. Work is proceeding to apply laser physics and laser techniques to the development of flow diagnostic tools to remotely probe gas dynamic flows in order to define and verify turbulence models. Research efforts in the materials area will provide thermal protection systems concepts and materials for heat shields to protect earth and planetary entry vehicles (probes); develop computational chemistry codes to calculate basic properties of matter; and expand the understanding of surface-environment inter-actions (corrosion). Research is also being conducted in the advanced electronics and materials area to determine atomic structure and properties of absorbed surface layers and to advance the state of the art of computing wave functions for molecules and atomic clusters.

In 1979, the Shuttle project will be supported with wind tunnel tests of models to study a variety of aerodynamic and thermodynamic problems. The Jupiter Orbiter Probe project will be supported with heat shield design and performance data, heat shield shape change effects on aerodynamics, and subsonic probe stability. In the area of orbiting astronomical instruments, work will continue to develop infrared detectors, to define systems for precision pointing and control of telescopes and to advance the technology required to cool the detectors to below 10 degrees Kelvin for support of the IRAS project. Ames Research Center is supporting

two space shuttle orbiter experiments. The first is to design, develop and conduct an OEX experiment for Infrared Imaging of Shuttle (IRIS) to obtain measurements of surface temperatures of the lower and side surfaces of the orbiter by remote imagery from the C-141 Kuiper Airborne Observatory (KAO). The second is to conduct OEX thermal protection experiments to study advanced materials and to evaluate possible cost and weight reductions for the thermal protection system for Shuttle and Advanced Space Transportation Systems.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

433 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or services being provided to all Ames Research Center organizations which cannot be directly identified to a benefiting program or project. The civil service personnel involved are:

Director and Staff

The center director, deputy director and the immediate staff, e.g., legal, patent counsel, equal opportunity, planning and analysis, public affairs, energy management and safety.

Management Support

Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support

This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment, and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Centerwide security and protection

Fire protection
 Custodial services
 Logistics support including transportation, supplies, etc.
 Medical care of employees
 Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS...</u>	<u>44,825</u>	<u>44,197</u>	<u>48,506</u>	<u>49,377</u>

Basis of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Permanent positions	39,531	38,695	42,554	43,291
b. Nonpermanent	552	642	718	748
c. Reimbursable detailees	174	237	219	313
d. Overtime and other compensation	<u>353</u>	<u>413</u>	<u>403</u>	<u>427</u>
Subtotal, Compensation	40,610	39,987	43,894	44,779

	<u>1977</u> <u>Actual</u>	<u>1978</u> <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		<u>1979</u> <u>Budget</u> <u>Estimate</u>
2. Benefits.....	<u>3,932</u>	<u>3,950</u>	<u>4,318</u>	<u>4,370</u>
Subtotal, Compensation and Benefits.....	<u>44,542</u>	<u>43,937</u>	<u>48,212</u>	<u>49,149</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	<u>37</u>	<u>50</u>	<u>99</u>	<u>33</u>
2. Personnel training	<u>246</u>	<u>210</u>	<u>195</u>	<u>195</u>
Subtotal ■ Support Costs	<u>283</u>	<u>260</u>	<u>294</u>	<u>228</u>
Total, Personnel and Related Costs...	<u>44,825</u>	<u>44,197</u>	<u>48,506</u>	<u>49,377</u>
A. <u>Compensation and Benefits</u>...	<u>44,542</u>	<u>43,937</u>	<u>48,212</u>	<u>49,149</u>
1. <u>Compensation</u>	<u>40,610</u>	<u>39,987</u>	<u>43,894</u>	<u>44,779</u>
a. Permanent positions	<u>39,531</u>	<u>38,695</u>	<u>42,554</u>	<u>43,291</u>

The funds will support 1,677 permanent positions in 1978 and 1979. The increase from the 1978 budget estimate to the current estimate is due to the October, 1977 pay increases.

Basis of Cost for Permanent Positions

In 1979 the cost of permanent positions will be \$43,291,000. The increase from 1978 results from the following:

Cost of permanent positions in 1978	42,554
Cost increase in 1979.	1,321
Full year effect of new positions in 1978	+538
Within grade advances and career development:	
Full year effect of 1978 actions.....	+284
Partial year effect of 1979 actions..	+397
Full year effect of 1978 pay raise..	+102

Cost decreases in 1978.....	-584
Turnover savings and abolished positions.	
Full year effect of 1978 actions.....	-356
Partial year effect of 1979 actions.....	-228
Cost of permanent positions in 1979	43

	1977 Actual	1978 Budget Estimate	1978 Current Estimate	1979 Budget Estimate
(Thousands of Dollars)				
b Nonpermanent positions				
1. Cost.....	552	642	718	748
2. Workyears.....	85	95	89	85

The 1979 plan includes 85 workyears which will support the following programs:

Distribution of Nonpermanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.....	20
Summer programs.....	13
Youth opportunity programs.....	30
Other temporary employment.....	22
Total.....	85

The increase from the 1978 estimate to the 1979 estimate is due to an increase of 6 workyears in the Youth Opportunity programs.

	1977 <u>Actual</u>	1978 Budget <u>Estimate</u> (Thousands of Dollars)	1978 Current Estimate	1979 Budget <u>Estimate</u>
c. Reimbursable detailees.....	174	237	219	313

The military personnel detailed to the Ames Research Center on a reimbursable basis are individuals experienced in aeronautics, helicopter technology and related fields.

The General Services Administration provides employees experienced in computation and systems analysis, on a reimbursable basis, to the Ames Research Center.

The increase in 1979 is due to an increase of 4 detailees for the helicopter program.

d. Overtime and other compensation.....	353	413	403	427
---	-----	-----	-----	-----

Overtime and night differential are used primarily for off-shift operation of major wind tunnel facilities such as the Unitary Plan Wind Tunnel System, the 40- by 80-Foot Subsonic Wind Tunnel, and the 6- by 6-Foot Supersonic Wing Tunnel. The slight decrease from the 1978 budget estimate is due to reduced operating level of the 6- by 6-Foot Supersonic Wind Tunnel. The increase in 1979 reflects the operation of new experimental aircraft.

2. <u>Benefits</u>	<u>3,932</u>	<u>3,950</u>	<u>4,318</u>	<u>4,370</u>
--------------------------	--------------	--------------	--------------	--------------

Following are the amounts of contribution by category:

<u>Category of Costs</u>				
Civil Service Retirement Fund.....	2,772	2,713	2,968	3,112
Employee life insurance.....	168	169	182	187
Employee health insurance.....	759	719	804	821
Workman's compensation..	128	205	205	205
FICA.....	19	19	16	16
Incentive Awards..	39	15	25	29
Other benefits.....	---	10	---	---
Severance pay.....	47	100	118	---
Total..	<u>3,932</u>	<u>3,950</u>	<u>4,318</u>	<u>4,370</u>

The increase from the 1978 budget to the 1978 current estimate is due to 1978 pay increases and the inclusion of severance pay as a result of personnel reductions.

The increase in 1979 over 1978 is related to the increase in the benefits associated with permanent compensation, partially offset by the reduction in severance pay.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
B. <u>Supporting Costs</u>	<u>283</u>	<u>260</u>	<u>294</u>	<u>228</u>
1 Transfer of perso 1 household effects..	37	50	99	33

The increase from the 1978 budget to the 1978 current estimate is due to personnel transferring to Ames with the helicopter project. The decrease in the FY 1979 budget estimate is due to a return to normal level.

2. Personnel training.....	246	210	195	195
----------------------------	-----	-----	-----	-----

The 1979 estimate for training costs will be at the 1978 level.

TRAVEL

MI <u>TRAVEL</u>	<u>1,003</u>	<u>1,071</u>	1	1
------------------------	--------------	--------------	---	---

Basis of Fund Requirements

A Program Travel	713	686	770	865
B. Scientific and Technical Development.....	117	139	121	135
C. Management and Operations Travel	<u>173</u>	<u>246</u>	<u>230</u>	<u>230</u>
Total, Travel	<u>1,003</u>	<u>1,071</u>	<u>1,121</u>	<u>1,230</u>

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> (Thousands of Dollars)	1978 <u>Current Estimate</u>	1979 <u>Budget Estimate</u>
A. Program Travel.....	713	<u>686</u>	<u>770</u>	<u>865</u>

Program travel is required for the accomplishment of the Center's mission and is the largest part of the Ames travel budget, accounting for 70 percent of travel costs for 1979. Travel for program purposes is required for the continuing efforts in space research, aircraft technology, flight simulation, fluid mechanics, airborne science and applications, and space life sciences.

The increase in the 1978 current estimate from the 1978 budget estimate is required to manage and coordinate two launch operations of the Pioneer Venus missions. The increase in 1979 over the 1978 current estimate is caused by the Lead-Center responsibilities in the short-haul aircraft and helicopter technology; the management and coordination of experimenters and contractor operations relative to the Jupiter Orbiter Probe, Infrared Astronomy Satellite, and Airborne Science-Spacelab Experiment System Simulation projects; and the monitoring of various contractors' performance in the design and construction of the 80- by 120-foot wind tunnel.

B. Scientific and Technical Development	<u>117</u>	<u>139</u>	<u>121</u>	<u>135</u>
---	------------	------------	------------	------------

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside ARC, as well as to present both accomplishments and problems to their associates. Many of the meetings are made up of working panels convened to solve certain problems for the benefit of the Government. The level of travel in 1979 is expected to increase to provide for the presentation of additional aeronautical papers to the scientific community.

C. Management and Operations Travel	<u>173</u>	<u>246</u>	<u>230</u>	<u>230</u>
---	------------	------------	------------	------------

Management and operations travel provides for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management and procurement activities, and travel of the Center's top management to NASA Headquarters, other NASA Centers, contractor plants, and local transportation. The funding level has been reduced from the 1978 budget to the current estimate to provide funds for higher priority program travel. The 1979 estimate remains at the current level.

FACILITIES SERVICES

Ames Research Center (ARC) is located on 421 acres of ground in a **complex** of facilities made **up** of laboratory and office type buildings as well as research wind tunnels.

This complex encompasses 2,300,000 gross square feet of building space including 10 major buildings. Also included are 11 major technical facilities. This physical plant supports an average daily population of 2,500 to 2,900 personnel. Many of the facilities are utilized on schedules involving more than one shift and frequently during off-peak hours.

Basis of Fund Requirements

	1977	1978	1979	
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> <u>of Dollars</u>	<u>Estimate</u>
111. <u>FACILITIES SERVICES</u>	<u>4,131</u>	<u>5,573</u>	<u>5,565</u>	<u>5,309</u>
A. <u>Maintenance and Related Services</u>				
1. Facilities	366	163	141	143
2. Equipment	<u>96</u>	<u>110</u>	<u> </u>	<u> </u>
Subtotal.....	462	273	196	208
B. <u>Custodial Services</u>	<u>1,303</u>	<u>1,201</u>	<u>1,270</u>	<u>1,350</u>
C. <u>Utilities Services</u>	<u>2,366</u>	<u>4,099</u>	<u>4,099</u>	3,751
Total, Facilities Services.....	<u>4,131</u>	<u>5,573</u>	5,565	5,309

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
A. <u>Maintenance and Related Services..</u>	<u>462</u>	<u>273</u>	<u>196</u>	<u>208</u>
1. Facilities	366	163	141	143
2. Equipment	96	110	55	65

The decrease indicated in the 1978 current estimate for these activities reflects a decision to accept reduced services in this time frame. The increase reflected in the 1979 budget estimates allows a modest growth in unit costs and a slight increase in maintenance of equipment services.

B. <u>Custodial Services...</u>	<u>1,303</u>	<u>1,201</u>	<u>1,270</u>	<u>1,350</u>
---------------------------------------	--------------	--------------	--------------	--------------

The 1979 budget reflects only unit cost growth over the 1978 current estimate. Included are:

1. Janitorial services (32 workyears of effort)	587
---	-----

Janitorial and building cleaning services are associated with approximately 1.5 million square feet of various types of space located in 75 buildings. Services are also provided for 50 trailers being utilized to provide temporary office and shop space.

2. Fire protection services	300
-----------------------------------	-----

Fire protection services are provided by the U.S. Naval Air Station, Moffett Field, CA. The 1979 estimate is based on the most recent actual cost experience.

3. Security services (27 workyears of effort)	456
---	-----

Included are security services for buildings and property including aircraft and computer facilities. Included also is the provision of "round-the-clock" staffing of the emergency duty office which monitors fire, security, and safety alarms and coordinates fire, security, health, and safety areas in emergency situations.

4. Other services	7
-------------------------	---

Pest control services on an as needed basis are funded in this activity.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>Budget</u> <u>Estimate</u>
C. <u>Utilities Services</u>	2,366	4,099	4,099	3,751

The major utility service is electricity with lesser requirements for natural gas, fuel, oil, water and sewage services,

1. Electricity (148,000 mW/Hrs.)	2,644
2. Natural gas (275,000 K cu. ft.)	917
3. Fuel oil (166,000 gals.)	82
4. Water and sewage.....	110

Electricity is provided by the U.S. Bureau of Reclamation and the Pacific Gas and Electric Company (PGECO), natural gas is provided by PGECO, water by the U.S. Naval Air Station, Moffett Field, and sewage services by the City of Mountain View.

Approximately 80% of electric power cost is consumed in the operation of high power demand research facilities such as the Unitary Plan Wind Tunnel System, the 40- by 80-foot Wind Tunnel, the 3.5-foot Hypersonic Tunnel, the 14-foot Transonic Wind Tunnel and in the operation of simulators and smaller wind tunnels, and other research facilities. Approximately 55% of natural gas is used in research facilities, the other part is used for heating and ventilation of institutional buildings. The funding level for 1979 will provide approximately 148 million kWh compared to 225 million kWh used in 1977 and the 207 million kWh planned for 1978.

The decrease in 1979 from the 1978 current estimate is in line with the priorities established by ARC management to curtail use of the installation wind tunnels consistent with program requirements. The facilities affected are the 14-foot and the 6- by 6-foot wind tunnels.

	1977	1978		1979
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		

BASIS OF FUND REQUIREMENTS

A. <u>Automatic Data Processing</u>				
1. Equipment	4	---	---	---
2. Operations	<u>349</u>	<u>230</u>	<u>292</u>	<u>301</u>
Subtotal	<u>353</u>	<u>230</u>	<u>292</u>	<u>301</u>
B. <u>Scientific and Technical Information</u>				
1. Education and Information.. ..	<u>245</u>	260	<u>275</u>	<u>261</u>
Subtotal	<u>245</u>	<u>260</u>	<u>275</u>	<u>261</u>
C. <u>Shop Support and Services</u>	<u>251</u>	<u>75</u>	<u>75</u>	<u>45</u>
Total, Technical Services.....	<u>849</u>	<u>565</u>	<u>642</u>	<u>607</u>
A. <u>Automatic Data Processing</u>	<u>353</u>	<u>230</u>	<u>292</u>	<u>301</u>

Obligations for administrative ADP operations and programming reflect ADP central facility operating costs which are incurred by administrative organizations. These costs are incurred through a system whereby user organizations are charged for actual usage of the ADP central facility's equipment and services.

1. Equipment	4	---	---	---
1977 cost of equipment was for a one-time lease of a terminal, the use of which has been completed.				
2. Operation.	349	230	292	301

--we---

This function includes ADP computer operations and programming that are charged to institutional organizations through the Center's charge-back systems. The charges include the institutional organizations' proportionate share of support service contracts. The 1979 increase will provide for the full year effort of 1978 cost increases related to the Central ADP facility.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
B. <u>Scientific and Technical Information</u>	<u>245</u>	<u>260</u>	<u>275</u>	<u>261</u>
1. Education and Information.....	245	260	275	261

Included in this category is a support service contract at a level of **11** workyears to perform public information services (e.g., tour guide), media development (e.g., public exhibits, etc.) and educational programs. The decrease in 1979 is due to decreased requirements for exhibits created in 1978 related to the Pioneer program.

C. <u>Shop Support and Services</u>	<u>251</u>	<u>75</u>	<u>75</u>	<u>45</u>
---	------------	-----------	-----------	-----------

This category includes administrative shop, photo and graphics services. The reduction in the 1979 estimate reflects a revision to the plan for services in this category.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>2,457</u>	<u>2,300</u>	<u>2,539</u>	<u>2,689</u>
---	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Administrative Communications.....	863	805	859	895
B. Printing and Reproduction.....	134	91	91	93
C. Transportation.....	178	166	177	189
D. Installation Common Services.....	<u>1,282</u>	<u>1,238</u>	<u>1,412</u>	<u>1,512</u>
Total, Management and Operations.....	<u>2,457</u>	<u>2,300</u>	<u>2,539</u>	<u>2,689</u>

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> (Thousands of Dollars)	1978 <u>Current Estimate</u> (Thousands of Dollars)	1979 <u>Budget Estimate</u>
A. <u>Administrative Communications</u>	863	<u>805</u>	<u>859</u>	<u>895</u>

Communication services are provided by General Services Administration (GSA) for the Federal Telecommunications Service (FTS) and the Pacific Telephone and Telegraph Company for local service. Other communications consist of teletype equipment and services provided by Western Union. The increase in the 1978 current estimate reflects increases in rates, offset by a reduction in requirements. The increase in 1979 is due to the full year effect of 1978 rate increases.

1. Local telephone services 394

The major part of this covers 1470 Centrex lines and 2258 telephone instruments which serves about 3,400 individuals on-site at ARC, including on-site contractors and tenants from other Government agencies.

2. Long distance telephone service..... 332

This service is (98%) FTS services; the other (2%) is commercial long distance, message unit charges and leased line service charges.

3. Non-telephone communications.. 169

Includes Western Union Telegraphic Services, leased equipment and postage.

B. Printing and Reproduction 134 91 91 93

The estimates for administrative printing includes the Printing and Reproduction Facility operating costs incurred by administrative organizations and includes supplies, materials, equipment acquisition and outside procurements. The increase in 1979 reflects the full year effect of 1978 cost increases.

C. Transportation 178 166 177 189

The estimates include rentals of GSA vehicles (other than passenger-carrying vehicles), vehicle fuel, oil, vehicle parts and materials, and repair and maintenance. The increase in 1979 will provide for increased cost of GSA rental rates and the cost of vehicle fuel and repair and maintenance.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands	of Dollars)	
D. <u>Installation Common Services</u>	<u>1,282</u>	<u>1,238</u>	<u>1,412</u>	<u>1,512</u>

These services include the Center Management and Staff Function, the Medical Services operation, and the Installation Support Services activities. The increase in 1979 results from the full year effect of 1978 rate increases.

1. Center management and staff 359

Includes the general management of the Center as an installation and includes such activities as the directorate offices, general and patent legal services, personnel, procurement, and financial management services. Significant cost items include the various Equal Employment Opportunity (EEO) programs for minorities and females, the Intergovernmental Personnel Act (IPA) programs, and studies and development of management systems.

2. Medical services. 249

Medical services include the staffing of the Health Unit, laboratory service fees, clinic supplies, and maintenance of clinic equipment.

3. Installation support Services 904

Installation support services consist predominantly of the support service contract of 31 workyears for supply management, mail, and pickup and delivery services. The balance of the functional costs consist of administrative equipment acquisition, office supplies and materials, and maintenance and repair and lease of office equipment.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ORGANIZATION AND STAFFING CHART AMES RESEARCH CENTER

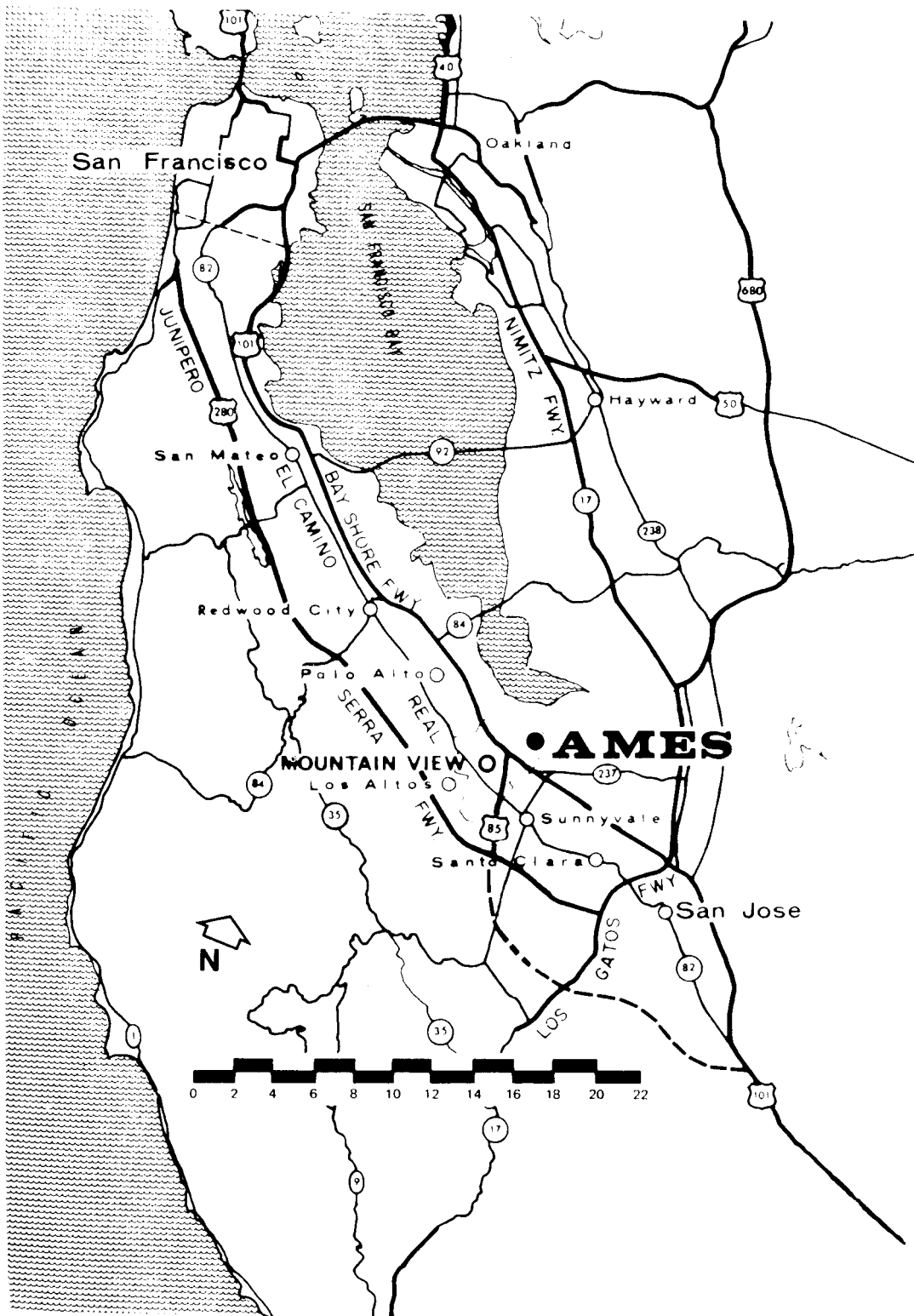
CENTER TOTAL	
EXCEPTED	78 79
GS 16	25 25
GS 15	3 3
GS 14	121 121
GS 13	200 200
ALL OTHER GS	1097 1097
WAGE GRADE	241 241
TOTAL PERMANENT	1817 1817

DIRECTOR	
EXCEPTED	78 79
GS 16	2 2
GS 15	3 3
GS 14	1 1
ALL OTHER GS	8 8
WAGE GRADE	11 11
TOTAL PERMANENT	11 11

PUBLIC AFFAIRS OFFICE EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 6 6	PATENT COUNSEL EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 3 3	HEALTH AND SAFETY OFFICE EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 3 3	CHIEF COUNSEL EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 3 3	EQUAL OPPORTUNITY PROGRAMS OFFICE EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 3 3	PLANNING AND ANALYSIS OFFICE EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 8 8
--	---	---	--	--	---

DIRECTOR OF AERONAUTICS & FLIGHT SYSTEMS EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 6 6	DIRECTOR OF ASTRONAUTICS EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 6 6	DIRECTOR OF LIFE SCIENCES EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 6 6	DIRECTOR OF RESEARCH SUPPORT EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 6 6	DIRECTOR OF ADMINISTRATION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 6 6
AERODYNAMICS DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 101 101	SPACE SCIENCE DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 15 15	PROJECT PIONEER EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 57 57	BIOMEDICAL RESEARCH DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 36 36	COMPUTATION DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 58 58
FLIGHT SYSTEMS RESEARCH DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 124 124	THERMO AND GAS DYNAMICS DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 136 136	CHEMICAL RESEARCH DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 18 18	MAN-VEHICLE SYSTEMS RESEARCH DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 23 23	INSTITUTE FOR ADVANCED COMPUTATION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 9 9
SIMULATION SCIENCES DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 49 49	SPACE PROJECTS DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 23 23	EXTRATERRESTRIAL BIOLOGY DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 44 44	RESEARCH FACILITIES & INSTRUMENTATION DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 126 126	PROCUREMENT DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 51 51
AIRCRAFT OPERATIONS DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 75 75	AIRBORNE MISSIONS AND APPLICATIONS DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 87 87	BIOSYSTEMS DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 25 25	TECHNICAL SERVICES DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 221 221	SERVICES & SUPPLY DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 23 23
HELICOPTER TECHNOLOGY DIVISION EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 36 36	HELICOPTER SYSTEMS OFFICE EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 6 6	RELIABILITY AND QUALITY ASSURANCE OFFICE EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 9 9	FACILITIES MAINTENANCE AND OPERATIONS MANAGEMENT OFFICE EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 1 1	UNIVERSITY AFFAIRS OFFICE EXCEPTED 78 79 GS 16 1 1 GS 15 1 1 GS 14 1 1 ALL OTHER GS 1 1 WAGE GRADE 1 1 TOTAL PERMANENT 2 2

LOCATION MAP



AMES RESEARCH CENTER FISCAL YEAR 1979 ESTIMATES LOCATION PLAN



GATE 18

SECURITY STATION

VISITOR RECEPTION BUILDING

NAVY MAIN GATE

NASA

National Aeronautics and
Space Administration

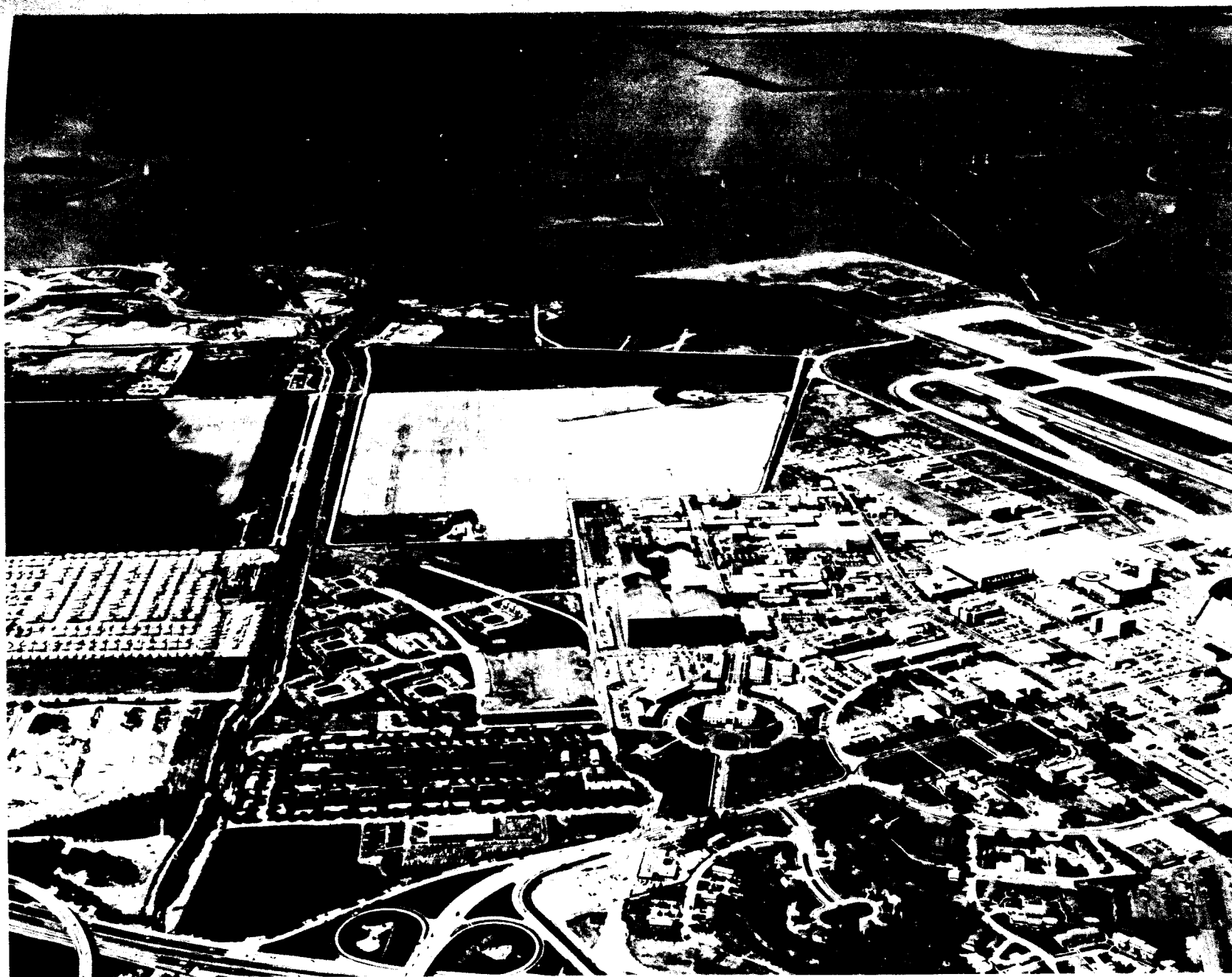
Ames Research Center
Moffett Field, California 94035

LEGEND

- A** MODIFICATION OF 3.5-FT. WIND TUNNEL
- B** MODIFICATION OF UNITARY PLAN WIND TUNNEL
- C** MODIFICATION OF 12-FT PRESSURE WIND TUNNEL

- N 200 ADMINISTRATION BUILDING
- N 201 AUDITORIUM
- N 202 MAIN LIBRARY
- N 202A SYSTEMS STUDIES BUILDING
- N 203 PHOTOTECHNOLOGY LABORATORY
- N 204 SPACE TECHNOLOGY BUILDING
- N 204A SPACE TECHNOLOGY BLDG. ANNEX
- N 205 PILOT MODEL OF 3.5 FOOT H.W.T.
- N 206 12 FOOT PRESSURE W.T.
- N 206A AUXILIARIES BUILDING
- N 207 HQ. ARMY AIR MOBILITY R&D LAB
- N 207A HFF SHOCK TUBE LABORATORY
- N 208 UNDERGROUND BALLISTIC RANGE
- N 209 PRESSURIZED BALLISTIC RANGE
- N 210 FLIGHT SIMULATION LABORATORY
- N 211 FLIGHT SUPPORT FACILITY
- N 212 MODEL DEVELOPMENT BUILDING
- N 213 RESEARCH SUPPORT BUILDING
- N 214 PAINT SHOP
- N 215 ARMY AIR MOBILITY R&D LAB. AMES DIR AND 7-BY 10 FOOT W.T. NO. 1
- N 216 7-BY 10 FOOT W.T. NO. 2 (AMRDL)
- N 216A COMPRESSOR BUILDING
- N 216B ARMY MODEL ASSEMBLY BUILDING
- N 217 MAGNETIC STANDARDS LABORATORY
- N 217A MAGNETIC TEST FACILITY (20 FT. COIL)
- N 218 14 FOOT TRANSONIC W.T.
- N 218A ELECTRICAL EQUIPMENT BUILDING
- N 219 ELECTRICAL SERVICES BUILDING
- N 220 TECHNICAL SERVICES BUILDING
- N 221A 40-BY 80 FOOT W.T.
- N 221A 20 G CENTRIFUGE
- N 222 2-BY 2 FOOT TRANSONIC W.T.
- N 222A CHEMICAL RESEARCH PROJECTS FACILITY
- N 224 POLYMER DEVELOPMENT FACILITY
- N 225 SUBSTATION
- N 226 6-BY 6 FOOT SUPERSONIC W.T. BUILDING
- N 227 UNITARY PLAN W.T. BUILDING
- N 227A 11 FOOT TRANSONIC W.T.
- N 227B 9-BY 7 FOOT SUPERSONIC W.T.
- N 227C 8-BY 7 FOOT SUPERSONIC W.T.
- N 227D UNITARY PLAN W.T. AUXILIARIES BUILDING
- N 228 42-INCH SHOCK TUNNEL
- N 229 EXPERIMENTAL FLUID DYNAMICS FACILITY (3.5 FT. H.W.T.)
- N 229A 35 FOOT HYPERSONIC W.T. AUXILIARIES BUILDING
- N 230 PHYSICAL SCIENCES RESEARCH LABORATORY
- N 231 FLUID DYNAMICS LABORATORY
- N 232 PILOT MODEL OF HYPERVELOCITY FREE FLIGHT FACILITY
- N 233 CENTRAL COMPUTER FACILITY
- N 233A INSTITUTE FOR ADVANCED COMPUTATION
- N 234 THERMAL PROTECTION LABORATORY
- N 234A THERMAL PROT. LAB. BOILER
- N 235 CAFETERIA BUILDING
- N 236 BIOSCIENCE LABORATORY
- N 237 HYPERVELOCITY FREE-FLIGHT FACILITY
- N 238 ARC JET LABORATORY
- N 239 LIFE SCIENCES RESEARCH LAB
- N 239A LIFE SCIENCES HIGH BAY
- N 240 MATERIALS SCIENCE LABORATORY
- N 241 ADMINISTRATIVE MANAGEMENT BUILDING
- N 242 SYSTEMS DEVELOPMENT FACILITY
- N 243 FLIGHT AND GUIDANCE SIMULATION LABORATORY
- N 243A SIMULATION EQUIPMENT BUILDING
- N 244 FLIGHT PROJECTS FACILITY
- N 245 SPACE SCIENCES RESEARCH LABORATORY
- N 246 MODEL CONSTRUCTION FACILITY
- N 247 40-BY 80 FOOT W.T. OFFICES
- N 248 AIRCRAFT SERVICING FACILITY
- N 248A GROUND SUPPORT EQUIPMENT BLDG.
- N 249 STATIC TEST STAND
- N 250 COMPRESSOR BUILDING
- N 251 MOTOR POOL
- N 252 PROPANE FUEL FACILITY
- N 253 VISTOR RECEPTION BUILDING
- TR 1 ELECTRO-OPTICAL TRAILER AREA
- TR 2 V-STOL TETHER AND HOVER TRAILERS
- TR 3 SPACE TECHNOLOGY TRAILER
- TR 4 ASSESS PROJECT TRAILERS
- TR 5 FLIGHT PROJECT TRAILERS
- TR 6 FLIGHT SUPPORT TRAILERS
- TR 7 AIRBORNE SCIENCE AIR TRAILERS
- TR 8 AIRCRAFT TEST VAN
- TR 9 AIRCRAFT TEST CONTROL TRAILER
- TR 10 LIFE SCIENCES TRAILERS
- TR 11 ADMINISTRATIVE SUPPORT TRAILERS
- TR 12 PUBLIC AFFAIRS TRAILER
- TR 13 COMPUTATION SUPPORT TRAILERS
- TR 14 SUPPLY SUPPORT TRAILERS
- TR 15 ANIMAL TRAILER DOCK

* FALLOUT SHELTERS



RPM 7-28

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

HUGH L. DRYDEN FLIGHT RESEARCH CENTER

DESCRIPTION

The Hugh L. Dryden Flight Research Center (DFRC), Edwards, California, is 65 air miles northeast of Los Angeles. The Center is located at the north end of Edwards Air Force Base on 521 acres of land under a permit from the Air Force. Utilities are provided by the Air Force on a reimbursable basis. The Center is adjacent to Rogers Dry Lake, a 55-square mile area with a complex of runways varying in length from five to 11 miles.

The physical plant consists of an office-laboratory building with adjoining shops, a flight maintenance hangar, a calibration hangar, a flight loads research facility, and an integrated support facility. Special Shuttle support facilities include the orbiter hangar and the orbiter mating-demating facility. Auxiliary buildings include warehouses, an auxiliary power system building, an aircraft maintenance dock, and hangar. The aerodynamic test range is operated with sites at Edwards, California, and Ely, Nevada. The total capital investment of the Dryden Flight Research Center, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1977, was \$78,943,000.

CENTER ROLES AND MISSIONS

The primary mission of the Dryden Flight Research Center, established in 1947, is to conduct aeronautical flight research in the areas of aerodynamics, structures, control systems, propulsion systems, disciplinary integration effects, safety, operations, and human-vehicle interactions in support of both military and civil national needs. This includes planning, conducting, analyzing, and reporting of flight research for the purposes of verification of predicted characteristics and the identification of unanticipated problems in actual flight. The principal and supporting roles of the Center are:

PRINCIPAL

Aeronautical Flight Research - conducting aeronautical flight research in the areas of aerodynamics, structures, control systems, propulsion systems, disciplinary integration effects, safety, operations, and human-vehicle interactions, which involves the planning and preparation of flight test programs, the development of flight test instrumentation, flight testing, and data analysis. DFRC also provides host Center

functions for NASA flight activities which are managed by other Centers but which require testing at the Edwards AFB complex. This function includes all institutional support and coordination as well as supervision of flight operations.

Remotely Piloted Vehicle Research - development of remotely piloted research aircraft, and management and operation of flight experiments.

SUPPORTING

Shuttle Orbiter Development - provide landing and recovery capability during Orbital Flight Tests (OFT) and contingency recovery capability after OFT.

Advanced Space Vehicle Configurations Technology - analysis and study of the effect of operational considerations on the design and test program of piloted research vehicles.

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FUNDS</u>			
	1977	1978	1978	1979
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands	of Dollars)	
I. Personnel and Related Costs	13,449	13,477	14,122	13,798
11. Travel... ..	320	399	389	388
III. Facilities Services	1,999	2,145	2,845	3,628
IV. Technical Services	310	103	313	348
V. Management and Operations	<u>1,255</u>	<u>910</u>	<u>1,058</u>	<u>1,319</u>
Total, fund requirements	<u>17,333</u>	<u>17,034</u>	<u>18,727</u>	<u>19,481</u>

Distribution of Permanent Positions by Program

	<u>1977 Actual</u>	<u>B Es</u>		<u>1979 Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>66</u>	<u>62</u>	<u>13</u>	<u>37</u>
Space shuttle	66	62	13	37
<u>Space Sciences</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>1</u>
Life sciences	1	1	1	1
<u>Space and Terrestrial Applications</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Technology utilization.....	1	1	1	1
<u>Aeronautics and Space Technology</u> ..	<u>311</u>	<u>326</u>	<u>348</u>	<u>324</u>
Aeronautical research and technology	311	326	348	324
<u>Tracking and Data Acquisition</u>	<u>36</u>	<u>30</u>	<u>30</u>	<u>30</u>
Subtotal, Direct positions	415	420	393	393
<u>Center Management and Operations Support</u> <u>Out Positions</u>	<u>100</u>	<u>100</u>	<u>97</u>	<u>97</u>
Total, permanent positions.....	<u>515</u>	<u>520</u>	<u>490</u>	<u>490</u>

PROGRAM DESCRIPTION

SPACE SHUTTLE

37 Permanent Positions (Civil Service)

In 1979, 37 civil service personnel will be utilized at Dryden Flight Research Center (DFRC) to support the Shuttle Orbital Flight Test (OFT) activities. Current planning is for initial orbital test flights to land at Edwards Air Force Base and be returned to Kennedy Space Center by shuttle carrier aircraft. Payloads will be removed prior to Shuttle ferry. DFRC will provide for coordination of all required support at the Edwards AFB complex. As a host Center, DFRC will provide institutional, range, and operational support for the shuttle orbital flight tests and will support transfer operations from the production facility to launch sites and vice versa, as well as maintain and operate the shuttle carrier aircraft.

LIFE SCIENCES

1 Permanent Position (Civil Service)

In 1979, one civil servant is required to develop and evaluate cost effective, reliable humanmachine control systems for use in remote manipulation such as manual landing of Shuttle type vehicles. Flight studies of remotely piloted high-performance vehicles will be performed to determine information requirements and procedures necessary for descent, approach, flare, touchdown, and roll out without direct external vision. TV sensors and displays with inside-out references will be evaluated to define optimum humanmachine design characteristics.

TECHNOLOGY UTILIZATION

1 Permanent Position (civil Service)

In 1979, one civil servant is required to continue the development of a practical minaturized pulse monitor and a non-invasive blood pressure indicator. The pulse monitor is needed as a sign-of-life indicator for police, fire, and other public service agencies with hazardous duty.

AERONAUTICAL RESEARCH AND TECHNOLOGY

324 Permanent Positions (civil Service)

In 1979, three hundred and twenty-four civil service personnel are required to accomplish aeronautical flight research activities at the DFRC. The aeronautical program includes research and technology; systems technology; experimental programs involving structures, fluid and flight dynamics, avionics, aircraft operations and safety, aeronautical human-vehicle interaction, aerodynamic vehicles, advanced civil and military aircraft, and highly maneuverable aircraft; and experimental aircraft research in Short Takeoff and Landing (STOL), supersonic cruise, and tilt rotor vehicles.

In 1979, the objectives of the activities under the research and technology programs are to provide continuing research and development efforts in the disciplinary areas of basic aerodynamics phenomena so that improved understanding can be applied to problems associated with aircraft in all flight regimes.

Under the systems technology program, in 1979, the digital fly-by-wire system, which is being developed for implementation in future aircraft, will be used in evaluating analytical redundancy management concepts; full-scale flight test evaluations of various area dynamic wake vortex alleviation devices will continue; the KC-135 aircraft will be used to test the winglet concept as a fuel savings means for current and future commercial transport aircraft; and the flight test phase of the highly maneuverable aircraft will be undertaken.

Within the experimental aircraft research programs, structural performance of candidate supersonic materials and fabrication techniques are being studied; the high speed flight testing support of a tilt rotor research aircraft is being coordinated to demonstrate the tilt rotor concept for civil and military applications; and the DFRC is providing a flight support program to determine the flight research capabilities of STOL operational characteristics and to demonstrate the advantages of integrated airframe/propulsion control systems.

TRACKING AND DATA ACQUISITION

30 Permanent Positions (Civil Service)

In 1979, thirty civil service personnel are required to maintain and operate the NASA Aerodynamic Test Range (ATR), which provides direct operational support for a wide variety of aerodynamic and aerospace programs conducted by DFRC, other NASA Centers, military services, and supporting contractors. During mission support operations, the various functional elements such as radar, tracking and data processing, communications, video, telemetry acquisition, and telemetry data processing all function in a coordinated manner to provide real time control and monitoring capabilities. Data links between the various Edwards facilities and the remote Ely Tracking Station provide continuous control and monitoring capabilities over the entire ATR.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

97 Permanent Positions (civil Service)

Center Management and Operations Support is defined as that support or services being provided to all Dryden Flight Research Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and immediate staff, and staff organizations, e.g. Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management resource control, and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities
 Data processing and computer support
 Reliability and quality assurance
 Center-wide security and protection
 Fire protection
 Custodial services
 Logistics support including transportation, supplies, etc.
 Medical care of employees
 Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> (Thousands of Dollars)	1978 <u>Current Estimate</u> (Thousands of Dollars)	1979 <u>Budget Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	13,449	13,477	14,122	13,798

Basis of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Permanent positions	11,325	11,428	12,016	11,760
b. Nonpermanent... ..	557	487	458	352
c. Reimbursable details	---	126	82	101
d. Overtime and other compensation.....	196	160	158	247
Subtotal, Compensation.....	12,078	12,201	12,714	12,460

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1979 <u>Budget</u> <u>Estimate</u>
2. <u>Benefits</u>	<u>1,204</u>	<u>1,190</u>	<u>1,279</u>	<u>1,194</u>
Subtotal, Compensation and Benefits... ..	<u>13,282</u>	<u>13,391</u>	<u>13,993</u>	<u>13,654</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	67	20	49	58
2. Personnel training	<u>100</u>	<u>66</u>	<u>80</u>	<u>86</u>
Subtotal, Supporting Costs.....	<u>167</u>	<u>86</u>	<u>129</u>	<u>144</u>
Total, Personnel and Related Costs.....	... <u>13,449</u>	<u>13,477</u>	<u>14,122</u>	<u>13,798</u>
A. <u>Compensation and Benefits</u> <u>13,282</u>	<u>13,391</u>	<u>13,993</u>	<u>13,654</u>
1. <u>Compensation</u>	<u>12,078</u>	<u>12,201</u>	<u>12,714</u>	<u>12,460</u>
a. Permanent positions	11,325	11,428	12,016	11,760

In 1978, the authorized complement will be reduced from 520 to 490 positions. The current estimate for 1978 is increased from the 1978 budget estimate as a result of pay increases. The costs in 1979 decrease as a result of the full year effect of the personnel reduction.

Basis of Cost for Permanent Positions

The estimate for permanent compensation in 1979 will support 490 permanent positions, which is a reduction of 30 positions from 1978. In 1979, the cost of permanent positions will be \$11,760,000 as derived from the following calculations:

Cost of permanent positions in 1978.....	12,016
Cost of increases in 1979.....	+292

Within grade advances and career development

Full year effect of 1978 actions.....	+117
partial year effect of 1979 actions.. ..	+160
Full year effect of 1978 pay increases.....	+15

Cost decreases in 1979..... -548

Turnover savings and abolished positions

Full year effect of 1978 actions.....	-405
Partial year effect of 1979 actions.....	-143

Cost of Permanent positions in 1979..... 11,760

1977 Actual	Budget Estimate	1978 Current Estimate	1979 Budget Estimate
(Thousands of Dollars)			

Other Compensation Costs

b. Nonpermanent Positions

1. Cost.....	557	487	458	352
2. Workyears	70	70	51	43

The current estimate for 1978 decreases from the 1978 budget estimate due to a reduction in nonpermanent workyears of effort. The savings from the decrease in workyears is partially offset by the cost of the October, 1977 pay increase. The 1979 plan reflects a further reduction in effort and costs consistent with current plans.

~~Distribution of Nonpermanent Workyears~~ by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training	26
Opportunity programs	12
Summer employment	2
Other temporary employment.. ..	<u>3</u>
<u>Total</u>	<u>43</u>

	1977	1978		1979
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
c. Reimbursable detailees.....	---	126	82	101

The services of a small group of military officers are used in the Center's programs where such assignments are of mutual benefit to NASA and the respective service. Under the existing agreements, the parent organization is reimbursed for salaries and related costs. In 1979, funding increases in anticipation of four detailee positions, as compared to three in 1978, and the full year effect of the pay raises.

d. Overtime and other compensation.....	196	160	158	247
---	-----	-----	-----	-----

Overtime is restricted to emergency repairs and abnormal temporary workload. A substantial portion is used to prepare for test flights. The 1978 current estimate decreases slightly from the 1978 budget estimate due to early completion of the shuttle ALT activities. In 1979, overtime requirements increase to support the Shuttle Orbital Flight Test (OFT) in the areas of flight operations, data systems, logistics, transportation, and facilities related requirements.

2. <u>Benefits.....</u>	<u>1,204</u>	<u>1,190</u>	<u>1,279</u>	<u>1,194</u>
-------------------------	--------------	--------------	--------------	--------------

The current estimates for 1978 increases over the 1978 budget estimate due to pay increases and the inclusion of severance pay to provide for the reduction of personnel. The 1979 estimates decrease due to the full year effect of the reduced personnel complement and the decrease in severance pay.

Category of Cost

Civil Service Retirement Fund.....	815	823	858	828
Employee life insurance.. ..	50	50	55	53
Employee health insurance.....	251	256	248	230
Workmen's compensation.....	41	31	31	
Contribution to FICA.....	19	10	44	25
Incentive Awards... ..	28	20		
Severance pay.....	---	---	50	---
Total.....	<u>1,204</u>	<u>1,190</u>	<u>1,279</u>	<u>1,194</u>

	1977 <u>Actual</u>	1978 Budget <u>Estimate</u> (Thousands of Dollars)	1978 Current <u>Estimate</u>	1979 Budget <u>Estimate</u>
B. <u>Supporting Costs</u>	<u>167</u>	<u>86</u>	<u>129</u>	144
1. Transfer of personnel	67	20	49	58

The costs associated with the transfer of personnel includes movement of household goods and expenses related to change of duty station. The 1978 current estimate exceeds the 1978 budget estimate due to increased number of transfers. The increase in 1979 is based on anticipated costs for two additional moves.

2. Personnel training	100	66	80	86
-----------------------------	-----	----	----	----

Training funds provide for the maintenance and expansion of skills which are essential in carrying out the agency's many complex technical programs. The cost reflects tuition and related fees at a number of government and nongovernment institutions. Approximately 30% of the total training budget is expended for scientific and engineering personnel training; another 30% supports management and supervisory training. Of the remaining amount, 21% is expended for training of technical personnel, while 19% is expended for administrative and clerical personnel. The 1978 current estimate was increased over the budget estimate after examination of the rate of expenditures experienced in 1977. The 1979 amount allows for announced increases in tuition costs.

TRAVEL

11. <u>TRAVEL</u>	<u>320</u>	<u>399</u>	<u>389</u>	<u>388</u>
-------------------------	------------	------------	------------	------------

Basis of Fund Requirements

A. Program Travel.....	160	218	212	240
B. Scientific and Technical Development	29	24	30	31
C. Management and Operations Travel.....	<u>131</u>	<u>157</u>	<u>147</u>	117
Total, Travel.....	<u>320</u>	<u>399</u>	<u>389</u>	<u>388</u>

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 Current <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
A. <u>Program Travel</u>	<u>160</u>	<u>218</u>	<u>212</u>	<u>240</u>

Program travel is directly related to the accomplishment of the Center's mission, and accounts for 62 percent of the 1979 travel estimate. The increase in 1979 is a result of the requirements of the Orbital Flight Test program.

B. <u>Scientific and Technical Development</u>	<u>29</u>	<u>24</u>	<u>30</u>	<u>31</u>
--	-----------	-----------	-----------	-----------

Scientific and technical development travel permits employees to participate in meetings and seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technical advances outside DFRC, as well as to present accomplishments and problems to their associates. Many of the meetings consist of working panels convened to solve specific governmental problems. It is estimated that travel costs in 1979 will be at the 1978 level.

C. <u>Management and Operations Travel</u>	<u>131</u>	157	<u>147</u>	<u>117</u>
--	------------	-----	------------	------------

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The decrease of the 1979 budget from the 1978 current estimate results from leasing fewer GSA vehicles.

FACILITIES SERVICES

The Dryden Flight Research Center (DFRC) is located on 521 acres of grounds and a complex made up of laboratory and office type buildings as well as flight test facilities.

This complex encompasses 400,000 gross square feet of building space including two major buildings. Also included are seven major technical facilities. This physical plant houses an average daily on-Center population of 1,200 to 1,500 personnel of all types. Many of the test facilities are utilized on schedules involving more than one shift.

111. <u>FACILITIES SERVICES</u>	<u>1,999</u>	<u>2,145</u>	<u>2,845</u>	<u>3,628</u>
---------------------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1979 <u>Budget Estimate</u>
A. <u>Rental of Real Property</u>	<u>71</u>	<u>54</u>	<u>54</u>	<u>77</u>
B. <u>Maintenance and Related Services</u>				
1. Facilities.....	1,042	1,050	1,302	1,660
2. Equipment	<u>76</u>	<u>94</u>	<u>79</u>	<u>93</u>
Subtotal....	<u>1,118</u>	<u>1,144</u>	<u>1,381</u>	<u>1,753</u>
C. <u>Custodial Services</u>	<u>523</u>	<u>701</u>	<u>1,118</u>	<u>1,406</u>
D. <u>Utility Services</u>	<u>287</u>	<u>246</u>	<u>292</u>	<u>392</u>
Total, Facilities Services.....	<u>1,999</u>	<u>2,145</u>	<u>2,845</u>	<u>3,628</u>

A. <u>Rental of Real Property</u>	<u>71</u>	<u>54</u>	<u>54</u>	<u>77</u>
---	-----------	-----------	-----------	-----------

This item provides for the rental of trailers to provide office, shop, laboratory, and storage space in support of the Space Shuttle Orbital Flight Test (OFT) Program.

B. Maintenance and Related Services

1. <u>Facilities</u>	<u>1,042</u>	<u>1,050</u>	<u>1,302</u>	<u>1,660</u>
----------------------------	--------------	--------------	--------------	--------------

This activity involves DFR and Air Force facilities used by Shuttle, and remotely-sited tracking and communication facilities. The increase in the 1978 current estimate from the 1978 budget estimate reflects a full year funding of the support service contracts. The increase in 1979 is due to plans to purchase maintenance related equipment and additional engineering contract services in support of the OFT. The major services are:

a. Maintenance and repair (47 workyears of effort)	1,079
Maintenance and repair to include routine maintenance of applicable facilities.	
b. Engineering services (6 workyears of effort)	163
c. Supplies, materials and equipment	418

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
2. <u>Equipment</u>	<u>76</u>	<u>94</u>	<u>79</u>	<u>93</u>

This activity involves the maintenance of facility type equipment services by local businesses with "on-call" contracts.

C. <u>Custodial Services</u>	<u>523</u>	<u>701</u>	<u>1,118</u>	<u>1,406</u>
------------------------------------	------------	------------	--------------	--------------

This activity involves a total of 63 workyears of effort to provide for security, janitorial, fire protection, refuse handling, and laundry services. The increase in the 1978 current estimate from the 1978 budget estimate reflects a full year funding of the support service contract. In 1979, the guard services effort will be increased to support the OFT program.

1. <u>Janitorial services (25 workyears of effort)</u>	638
--	-----

This activity includes:

- a. Janitorial services
- b. Refuse and pest control
- c. Fire protection, obtained from the Air Force on a reimbursable basis.

2. Security guard services (38 workyears of effort)..... 768

This activity includes:

- a. Security of all on-site Government facilities and equipment
- b. Mail and messenger service
- c. Badging of all on-site personnel and visitors.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1979 <u>Budget</u> <u>Estimate</u>
D. <u>Utilities</u>	<u>287</u>	<u>246</u>	<u>292</u>	392

Utility services are purchased through USAF contracts with regional utility companies. The major cost is for electricity with lesser amounts for natural gas, fuel oil, and water and sewage services. A summary of the proposed DFRC utilities budget for 1979 is as follows:

1. Electricity (14,400 mWh)	269
2. Natural gas (28,500 K cu. ft.)	88
3. Fuel oil (52,000 gals.)	23
4. Water and sewage.....	<u>12</u>
Total.....	<u>392</u>

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u>	<u>310</u>	<u>103</u>	<u>313</u>	<u>348</u>
-------------------------------------	------------	------------	------------	------------

Basis of Fund Requirements

A. Automatic Data Processing

1. Operations	<u>164</u>	<u>17</u>	<u>117</u>	218
Subtotal.....	<u>164</u>	<u>17</u>	<u>117</u>	<u>218</u>

	1977 Actual	1978 Budget Estimate Current Estimate (Thousands of Dollars)		1979 Budget Estimate
B. <u>Scientific and Technical Information</u>				
1. Library.....	12	13	13	14
2. Education and information.....	<u>42</u>	<u>46</u>	<u>46</u>	<u>49</u>
Subtotal.....	<u>54</u>	<u>59</u>	<u>59</u>	<u>63</u>
C. <u>Shop Support and Services</u>	<u>92</u>	<u>27</u>	<u>137</u>	<u>67</u>
Total, Technical Services.....	<u>310</u>	<u>103</u>	<u>313</u>	<u>348</u>

A. Automatic Data Processing..... 164 17 117 218

Covers the support required for administrative keypunch and programming operations at the Center to satisfy payroll, personnel, accounting, and management information systems requirements of NASA and DFRC management. The 1979 estimate includes funds for the development of a management information system and maintenance of the existing systems.

B. Scientific and Technical Information..... 54 59 59 63

Includes the purchase of books, supplies, and materials for, and operation of the Dryden Library. It also provides for public information services.

1. Library..... 12 13 13 14

Provides for the purchase of books, supplies, and materials for, and the operation of the Dryden Flight Research Center library.

2. Education and information..... 42 46 46 49

Provides for the gathering and dissemination of information about the Center's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary school levels. Assistance to the mass communications media includes the gathering and exposition of newsworthy material in support of their requests, and take such forms as press kits, news releases, television and radio information tapes and clips, and feature material.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
C. <u>Shop Support and Services</u>	<u>92</u>	<u>27</u>	<u>137</u>	<u>67</u>

Provides funding for two workyears of support service contractors for graphics and safety. The 1978 current estimate increases due to one time equipment purchases for OFF and then returns to a normal level of support in 1979.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>1,255</u>	<u>910</u>	<u>1,058</u>	<u>1,319</u>
---	--------------	------------	--------------	--------------

Basis of Fund Requirements

A. Administrative Communications.....	397	313	380	346
B. Printing and Reproduction	23	23	23	25
C. Transportation.....	274	154	305	203
D. Installation Common Services.....	<u>561</u>	420	<u>350</u>	<u>745</u>
Total, Management and Operations	<u>1,255</u>	<u>910</u>	<u>1,058</u>	<u>1,319</u>

A. <u>Aministrative Communications</u>	<u>397</u>	<u>313</u>	<u>380</u>	<u>346</u>
--	------------	------------	------------	------------

Includes estimates for postage, Federal Telecommunication System (FTS), local telephone and exchange service, rental of TWX equipment, and telephone operators provided under a support service contract. In 1979, three support contract workyears of effort will be used, and the reduction in cost is consistent with the current support plan.

1. Local telephone service.....	241
---------------------------------	-----

This funding covers the service for 646 station lines and 997 telephone instruments at the Center. Also included is the lease of switchboard equipment and commercial toll charges and the support service contract for three telephone operators.

2. Long distance telephone service.....	75
---	----

This category provides funding to support 26 FTS lines and five lines to Lancaster, California.

3. Non-telephone communications.....	30
--------------------------------------	----

This funding provides teletype (TWX) service and postage charges for the Center.

	1977 Actual	1978 Budget Estimate (Thousands of Dollars)	1978 Current Estimate	1979 Budget Estimate
B. <u>Printing and Reproduction</u>	<u>23</u>	<u>23</u>	<u>23</u>	<u>25</u>

Includes the contractual publication of information and materials, and the related composition and binding operations. All common processes of duplication, including photostating, blueprinting, and microfilming are included.

C. <u>Transportation</u>	<u>274</u>	<u>154</u>	<u>305</u>	<u>203</u>
----------------------------------	------------	------------	------------	------------

Provides funds for government bills of lading issued to common carriers to move freight by rail, truck, water, and air; and to fund shipments by United Parcel services, and contract support for the Center's general purpose vehicles. The decrease in 1979 is primarily due to a reduction of five workyears of contract support services which are no longer required due to completion of Approach and Landing tests in 1978

D. <u>Installation Common Services</u>	<u>561</u>	420	<u>350</u>	745
--	------------	-----	------------	-----

This category provides for physical examinations for DFRC pilots, reimbursement to the Air Force Flight Test Center for shuttle support, supplies, materials, and equipment to support the general administrative effort; rental of equipment; and the audio-visual support service contract. The increase in 1979 will provide for the purchase of additional supply and equipment items; a large increase in the level of Air Force Flight Test Center support required for Orbiter Flight Test; a small increase for rental of equipment; the replacement of two sedans, and the purchase of seven trucks.

1. Pilot physicals.....	13
-------------------------	----

This category includes the costs for DFRC pilots physicals performed by the Lovelace Clinic in Albuquerque, New Mexico.

2. Air Force Flight Test Center (AFFTC) support

This category includes reimbursement to the Air Force for services and miscellaneous supplies and materials provided in support of the space shuttle Orbital Flight Test (OFT) program.

3. Supplies and equipment 314

This category funds office supplies, fuel for the motor pool vehicles, office equipment and photographic equipment.

4. Rental of equipment 80

Rented equipment is mostly office equipment (e.g., photocopy type machines) that is more economical to rent than to buy.

5. Audio Visual Support..... 29

This category represents costs of a support service contractor to operate and maintain the Center's audio visual services.

National Aeronautics and Space Administration

Hugh L. Dryden Flight Research Center

SUMMARY STAFFING		
	78	79
Excepted	12	12
GS-16	2	2
GS-15	20	20
GS-14	40	40
All Other GS	414	414
Wage Board	2	2
Total Permanent	490	490

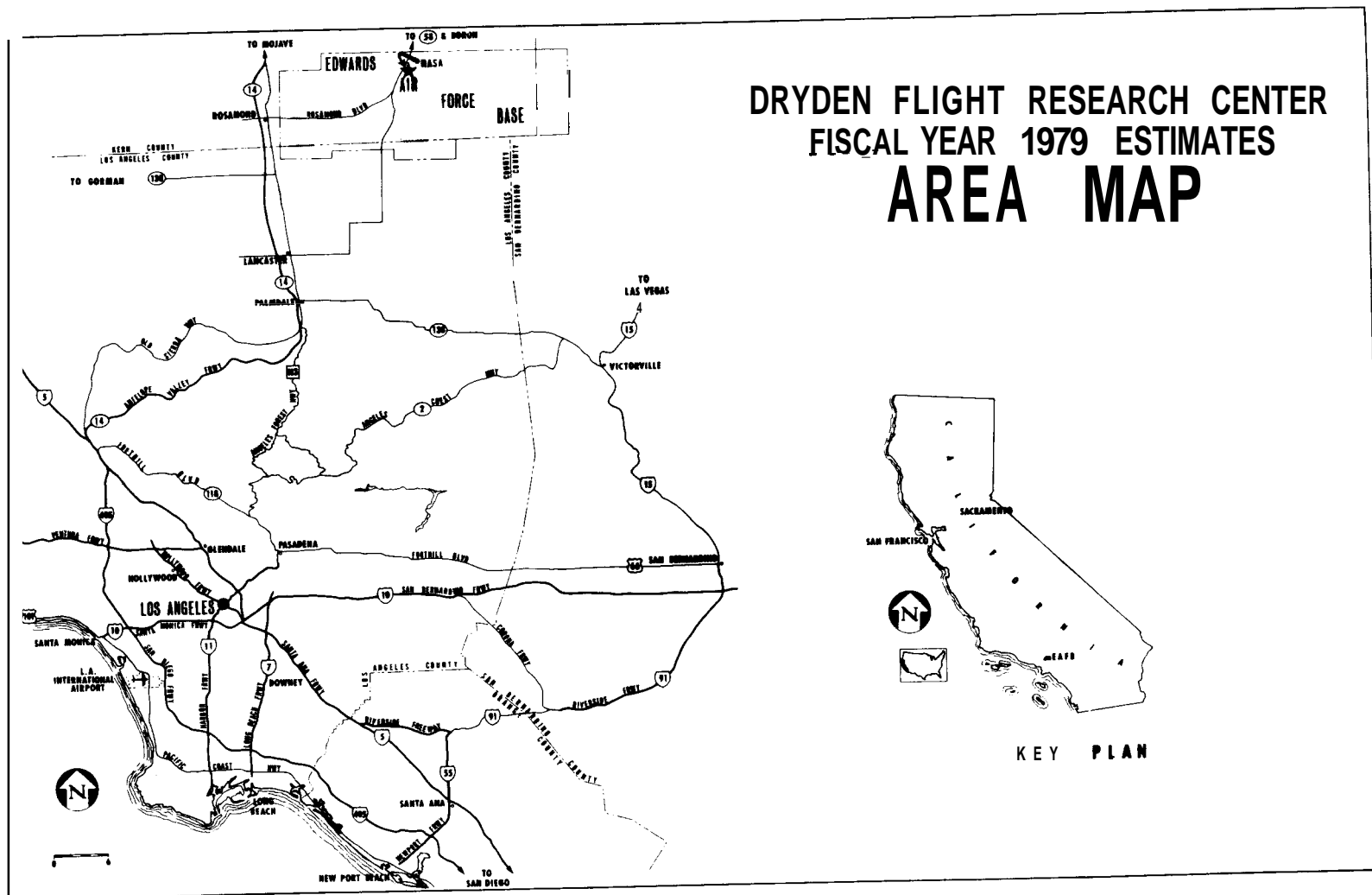
OFFICE OF THE DIRECTOR		
	78	79
Excepted	4	4
GS-16	1	1
GS-15	2	2
GS-14	1	1
All Other GS	26	26
Wage Board	-	-
Total Permanent	34	34

DIRECTOR OF AERONAUTICS		
	78	79
Excepted	4	4
GS-16	-	-
GS-15	6	6
GS-14	22	22
All Other GS	71	71
Wage Board	-	-
Total Permanent	103	103

DIRECTOR OF DATA SYSTEMS		
	78	79
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	8	8
All Other GS	113	113
Wage Board	-	-
Total Permanent	126	126

DIRECTOR OF FLIGHT OPERATIONS		
	78	79
Excepted	2	2
GS-16	1	1
GS-15	6	6
GS-14	5	5
All Other GS	139	139
Wage Board	-	-
Total Permanent	153	153

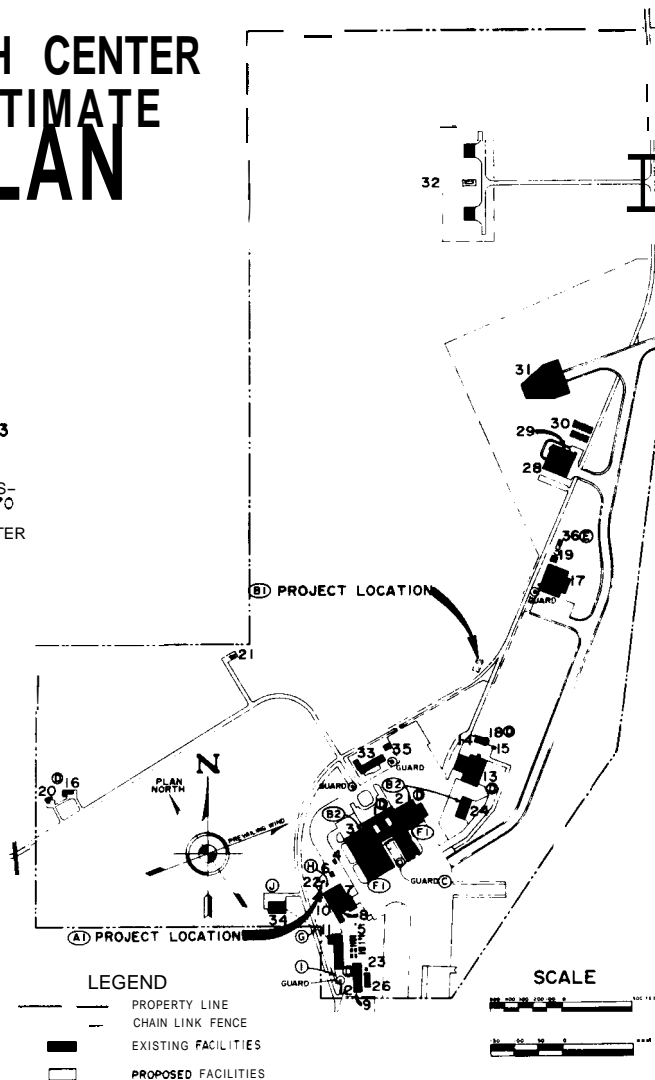
DIRECTOR OF ADMINISTRATION AND MANAGEMENT SUPPORT		
	78	79
Excepted	1	1
GS-16	-	-
GS-15	2	2
GS-14	4	4
All Other GS	65	65
Wage Board	2	2
Total Permanent	74	74



DRYDEN FLIGHT RESEARCH CENTER FISCAL YEAR 1979 ESTIMATE LOCATION PLAN

PROPOSED FACILITIES

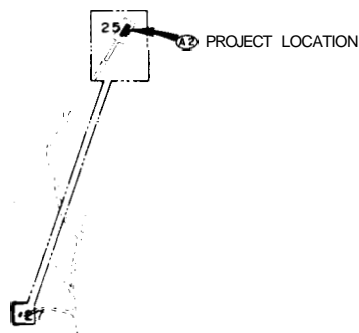
- (A) MODIFICATION OF STANDBY POWER SYSTEM
 - 1. PHASE I-BUILDING 4889
 - 2. PHASE II-BUILDING 4982
- (B) 1. MODIFICATION OF STRUCTURE 4850, SUBSTATION 16
- 2. MASTER CONTROL FOR TOTAL POWER DISCONNECT, BLDGS- 4801, 4802 & 4823
- (C) UTILITY CONTROL SYSTEM
- (D) WET PIPE SPRINKLER SYSTEMS IN BLDGS- 4800, 4801, 4810, 4820, 4824, 4830 & 4870
- (E) CONSTRUCTION OF ALTERNATE FIRE WATER STORAGE TANK NEAR BUILDING 4853
- (F) LUMP-SUM REHABILITATION AND MODIFICATION
 - 1. MODIFICATION OF HANGAR DOORS, BLDGS 4801 & 4802
 - 2. REHABILITATION OF ROOF, BLDG 4800
 - 3. ION-DETECTION SYSTEM IN HANGARS
 - 4. SMALL PROJECTS
 - a. FLIGHT OPERATIONS CREW ROOM TOILET MODIFICATION
 - b. INSULATE REMAINDER OF BLDGS 4809 & 4810
 - c. REHABILITATE DISPENSARY MODULAR STRUCTURE, BLDG 4813
 - d. REHABILITATE LAWN SPRINKLER SYSTEM NORTH OF BLDG 4800
 - e. EUGENE SOBER FIRE INSPECTION REPORT ITEMS
- (G) DOCUMENT MOVING SYSTEM
- (H) VEHICLE WASHING FACILITY
- (I) INSTALLATION OF PAINT BOOTH & SHED
- (J) FENCED STORAGE ENCLOSURE



EXISTING FACILITIES

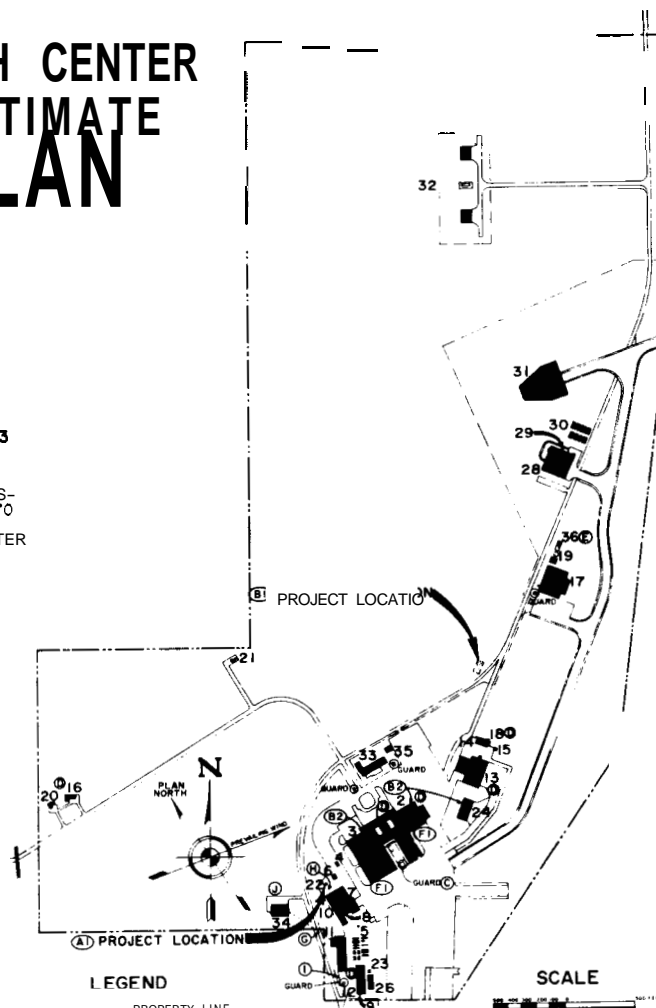
- 1 LABORATORY BUILDING (4800)
- 2 AIRCRAFT CONSTRUCTION AND MODIFICATION HANGAR (4801)
- 3 MAIN HANGAR (4802)
- 4 AIRCRAFT TIRE REPAIR SHOP (4803)
- 5 TRAILER PARK AND MOWLAR BLOGS
- 6 BOILER HOUSE (4886)
- 7 SHOPS (AGE. MODEL, BATTERY GARAGE) (4806)
- 8 STORAGE BUILDING (4807A)
- 9 PHYSIOLOGY STRESS LAB (4810)
- 10 WAREHOUSE NP 2 (4808)
- 11 WAREHOUSE NP 3 (4809)
- 12 WAREHOUSE NP 4 (4810)
- 13 FLIGHT LOADS RESEARCH FACILITY (4820)
- 14 PAINT SPRAY BUILDING (4821)
- 15 PAINT STORAGE BUILDING (4822)
- 16 COMMUNICATIONS BUILDING (4824)
- 17 MAINTENANCE DOCK (4826)
- 18 WOOD SHOP (4830)
- 19 WAREHOUSE NP 5 (4831)
- 20 RADAR BUILDING (4870)
- 21 100FT. TOWER, BORESIGHT TARGET ASSEMBLY AND EQUIP. BLDG (4887)
- 22 CENTRAL STANDBY ELECTRICAL POWER FACILITY (4889)
- 23 STORAGE BUILDING (4804)
- 24 AIRCRAFT SERVICING DOCK (4823)
- 25 FPS-16 RADAR FACILITY (4882)
- 26 WAREHOUSE NP 6 (4827)
- 27 100FT. TOWER, BORESIGHT TARGET ASSEMBLY AND EQUIP. BLDG (4881)
- 28 SHUTTLE HANGAR (4833)
- 29 SHUTTLE SHOP (4834)
- 30 SHOP TRAILER COMPLEX (4854)
- 31 SHUTTLE MATING STRUCTURE (4860)
- 32 PROPELLANT FUEL AND OXIDIZER STORAGE AREA (4855)
- 33 INTEGRATED SUPPORT FACILITY (4825)
- 34 WAREHOUSE NP 7 (4832)
- 35 PAO TRAILERS
- 36 PUMP STATION NP 1 (4853)

DRYDEN FLIGHT RESEARCH CENTER FISCAL YEAR 1979 ESTIMATE LOCATION PLAN



PROPOSED FACILITIES

- A MODIFICATION OF STANDBY POWER SYSTEM
 - 1. PHASE I-BUILDING 4889
 - 2. PHASE II-BUILDING 4982
- B MODIFICATION OF STRUCTURE 4850, SUBSTATION 16
 - 2. MASTER CONTROL FOR TOTAL POWER DISCONNECT. BLDGS-4801, 4802 & 4823
- C UTILITY CONTROL SYSTEM
- D WET PIPE SPRINKLER SYSTEMS IN BLDGS-4800, 4801, 4810, 4820, 4824, 4830 & 4870
- E CONSTRUCTION OF ALTERNATE FIRE WATER STORAGE TANK NEAR BUILDING 4853
- F LUMP-SUM REHABILITATION AND MODIFICATION
 - 1. MODIFICATION OF HANGAR DOORS, BLDGS 4801 & 4802
 - 2. REHABILITATION OF ROOF, BLDG 4800
 - 3. ION-DETECTION SYSTEM IN HANGARS
 - 4. SMALL PROJECTS
 - a. FLIGHT OPERATIONS CREW ROOM TOILET MODIFICATION
 - b. INSULATE REMAINDER OF BLDGS 4809 & 4810
 - c. REHABILITATE DISPENSARY MODULAR STRUCTURE, BLDG 4813
 - d. REHABILITATE LAWN SPRINKLER SYSTEM NORTH OF BLDG 4800
 - e. EUGENE SOBER FIRE INSPECTION REPORT ITEMS
- G DOCUMENT MOVING SYSTEM
- H VEHICLE WASHING FACILITY
- I INSTALLATION OF PAINT BOOTH & SHED
- J FENCED STORAGE ENCLOSURE



LEGEND

- PROPERTY LINE
- - - CHAIN LINK FENCE
- EXISTING FACILITIES
- PROPOSED FACILITIES

EXISTING FACILITIES

- 1 LABORATORY BUILDING (4800)
- 2 AIRCRAFT CONSTRUCTION AND MODIFICATION HANGAR (4801)
- 3 MAIN HANGAR (4802)
- 4 AIRCRAFT TIRE REPAIR SHOP (4803)
- 5 TRAILER PARK AND MOWLAR BLDGS
- 6 BOILER HOUSE (4886)
- 7 SHOPS (AGE. MODEL, BATTERY GARAGE) (4806)
- E STORAGE BUILDING (4807A)
- 9 PHYSIOLOGY STRESS LAB (4810)
- 10 WAREHOUSE NQ 2 (4808)
- 11 WAREHOUSE NQ 3 (4809)
- 12 WAREHOUSE NQ 4 (4810)
- 13 FLIGHT LOADS RESEARCH FACILITY (4820)
- 14 PAINT SPRAY BUILDING (4821)
- 15 PAINT STORAGE BUILDING (4822)
- 16 COMMUNICATIONS BUILDING (4824)
- 17 MAINTENANCE DOCK (4826)
- 18 WOOD SHOP (4830)
- 19 WAREHOUSE NQ 5 (4831)
- 20 RADAR BUILDING (4870)
- 21 100FT. TOWER, BORESIGHT TARGET ASSEMBLY AND EQUIP. BLDG (4887)
- 22 CENTRAL STANDBY ELECTRICAL POWER FACILITY (4859)
- 23 STORAGE BUILDING (4804)
- 24 AIRCRAFT SERVICING DOCK (4823)
- 25 FPS-16 RADAR FACILITY (4982)
- 26 WAREHOUSE NQ 6 (4827)
- 27 100FT. TOWER, BORESIGHT TARGET ASSEMBLY AND EQUIP. BLDG (4981)
- 28 SHUTTLE HANGAR (4833)
- 29 SHUTTLE SHOP (4834)
- 30 SHOP TRAILER COMPLEX (4854)
- 31 SHUTTLE MATING STRUCTURE (4860)
- 32 PROPELLANT FUEL AND OXIDIZER STORAGE AREA (4855)
- 33 INTEGRATED SUPPORT FACILITY (4825)
- 34 WAREHOUSE NQ 7 (4832)
- 35 PAO TRAILERS
- 36 PUMP STATION NQ1 (4853)

HUGH L. DRYDEN FLIGHT RESEARCH CENTER
FISCAL YEAR 1979 ESTIMATES



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATE

LANGLEY RESEARCH CENTER

DESCRIPTION

The Langley Research Center is located at Hampton, Virginia. It is situated between Norfolk and Williamsburg, Virginia, in the tidewater area of Hampton Roads. The Center utilizes 810 acres of Government-owned land, divided into two areas by the runway facilities of Langley Air Force Base. The West Area consists of 787 acres, all owned by NASA. The East Area comprises 23 acres under the Air Force permit. Runways, some utilities, and certain other facilities are used jointly by NASA and the Air Force. In addition, there are 110 acres of NASA-owned land located in the city of Newport News, Virginia, and 3,276 acres under permit from the Department of Interior. The total acreage presently owned, under permit, or leased, is 4,196. The total capital investment of the Langley Research Center, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1977, was \$483,133,000.

CENTER ROLES AND MISSIONS

Langley Research Center (LaRC) continues to be a major factor in the development of aeronautics and space technology in the United States.

Langley has developed recognized areas of technical excellence within the civil service staff and facilities of superior merit; that is, major technical facilities which constitute a national resource. The principal and supporting roles are:

PRINCIPAL

Long-Haul Aircraft Technology - developing a technology base for improving long-haul aircraft as cost effective, safe and environmentally compatible transportation modalities.

General Aviation Aircraft Technology - developing and maintaining an engineering technology base related to improving general aviation aircraft.

Fundamental Aerodynamics - advancing the general state-of-the-art, both theoretical and experimental.

Acoustics and Noise Reduction - conducting research and developing a technology base related to reducing aircraft noise.

Aerospace Vehicle Structures and Materials - development of a technology base for facilitating advances.

Avionics Technology - developing a technology base related to improving avionics.

Military Support - provision of technical support to military aviation in areas consistent with other LaRC aeronautics roles and LaRC unique capabilities.

Advanced Space Vehicle Configurations Technology - developing a technology base related to advanced configurations, including advanced space transportation concepts.

Sensor and Data Acquisition Technology - developing a technology base for sensors and data acquisition devices.

Technology Experiments in Space - development and management of the Long Duration Exposure Facility and Advanced Technology Laboratory. Definition and development of experiments in areas consistent with other LaRC space roles.

Environmental Quality Monitoring Technology - developing improved techniques for environmental monitoring. Includes maintenance of discipline base, experiment development/management, data analysis, and investigator management and specialized ground/aircraft investigations. Also includes development of Shuttle payloads related to environmental monitoring.

SUPPORTING

Helicopter Technology - contributing to the development of the technology base with focus on structures, aeroelasticity, acoustics, noise, and avionics components.

Hypersonic Propulsion Systems - contributing to technology base of air breathing propulsion systems by advancing the state-of-the-art of hypersonic propulsion.

Planetary Entry Technology - providing planetary and earth entry aerothermodynamics experimental and analytical data.

Computational Fluid Dynamics - contributing to the software technology base.

Upper Atmospheric Research - mission analysis, sensor development, data interpretation and utilization for remote sensing; contributing to model development.

Launch Vehicle Procurement - development and procurement for science/applications missions, including Scout and meteorological sounding rockets.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1979 <u>Budget Estimate</u>
I. Personnel and Related Costs.....	80,314	79,986	85,456	85,568
II. Total	1,887	2,066	1,999	2,156
III. Facilities Services.....	7,508	6,374	8,237	9,321
IV. Technical Services.....	1,514	1,572	1,721	1,825
V. Management and Operations	<u>4,374</u>	<u>5,413</u>	<u>5,176</u>	<u>5,709</u>
Total, fund requirements	<u>95,597</u>	<u>95,411</u>	<u>102,589</u>	<u>104,579</u>

Distribution of Permanent Positions by Program

	<u>1977</u> <u>Actual</u>	<u>1978</u> <u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>1979</u> <u>Budget</u> <u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>68</u>	<u>53</u>	<u>54</u>	<u>52</u>
Space shuttle	21	7	9	7
Space flight operations	2	---	---	---
Expendable launch vehicles.....	45	46	45	45
<u>Space Sciences</u>	<u>51</u>	<u>47</u>	15	<u>9</u>
Physics and astronomy	7	8	9	9
Lunar and planetary exploration	44	39	6	---
<u>Space and Terrestrial Applications</u>	<u>212</u>	<u>255</u>	<u>221</u>	<u>239</u>
Space applications	199	240	208	226
Technology utilization.....	13	15	13	13
<u>Aeronautics and Space Technology</u>	<u>2,039</u>	<u>2,056</u>	<u>2,029</u>	<u>2,019</u>
Aeronautical research and technology	1,464	1,462	1,451	1,444
Space research and technology	<u>575</u>	<u>594</u>	<u>578</u>	<u>575</u>
Subtotal, direct positions	2,370	2,411	2,319	2,319
<u>Center Management and Operations Support Positions</u>	<u>765</u>	<u>754</u>	<u>750</u>	<u>750</u>
Total, permanent positions..	<u>3,135</u>	<u>3,165</u>	<u>3,069</u>	<u>3,069</u>

PROGRAM DESCRIPTION

SPACE SHUTTLE

7 Permanent Positions (Civil Service)

In FY 1979, civil service personnel will be working on test and evaluation of propellant dynamics.

EXPENDABLE LAUNCH VEHICLES PROGRAM

45 Permanent Positions (civil Service)

The expendable launch vehicle program at Langley provides centralized procurement of the Scout Launch Vehicle. In 1979 civil service personnel will support a program which includes the procurement of launch vehicle hardware, launch services, engineering, and maintenance.

The 1979 launches under this program will be conducted from sites located at the Western Test Range in California, the Wallops Flight Center in Virginia, and the San Marco platform off the coast of Kenya, Africa.

PHYSICS AND ASTRONOMY

9 Permanent Positions (Civil Service)

In 1979, civil service personnel will be involved in a small activity for Upper Atmospheric Research. This program's goal is to understand the earth's atmosphere well enough to assess any changes caused by man, and to determine whether or not there is any associated change in the transmission of solar radiation.

SPACE APPLICATIONS

226 Permanent Positions (Civil Service)

The space applications program at Langley is characterized by a research program that is a national resource for understanding environmental problems and for developing related monitoring systems. The Center's technical expertise is widely recognized in the areas of remote sensing of the terrestrial atmospheric trace species and analytical atmospheric modeling. The STAR Computer gives Langley a superior computing capability for atmospheric and earth radiation/climate modeling.

The Center's capability in environmental sciences results from a blending of analytical modeling with the conception, development, and application of remote sensing systems to environmental monitoring and the Earth's radiation budget. The Center's sensor development program encompasses the broadest possible range of advanced techniques, including correlation gas filter radiometry and interferometry, laser heterodyne radiometry, and lidar. In addition, the Center is working on flight experiments utilizing solar occultation, limb scanning, and nadir viewing. Significant advances are being made in microwave radiometry and scatterometry, and push-broom multispectral scanner techniques.

The Center's long-range atmospheric research program will significantly advance our understanding of both the stratosphere and troposphere. A significant improvement in our understanding of man's impact on the stratosphere and climate will be obtained from the combination of Langley developed statistical/theoretical models and the comprehensive global data set provided by spaceborne sensors such as Nimbus-G, SAGE, and the Halogen Occultation Experiment. The HALOE instrument will measure stratospheric species involved in ozone destruction by chlorine chemistry.

Studies of the Earth's radiation budget will be fundamental to the understanding of climate phenomena. Langley has the responsibility for the science, sensor development, and data management for the Earth Radiation Budget Satellite System, prime element in the NASA support of the National Climate Program. Preliminary radiation budget studies, based on Nimbus data, have explored the relationship of radiation budget to such climatological parameters as cloudiness, snow and ice cover, and sea surface temperature.

Studies will also be performed on the relation between pole-to-equator gradients in Earth radiation budget and transport of energy in the atmosphere, relation of radiation budget to general circulation parameters, and its role in parameterizing long-term atmospheric processes, and in statistical forecasting. The statistical models constructed from SAGE will be used to study the relationship of Earth radiation flux changes to stratospheric aerosol properties and ozone distributions, and their relationship to climate phenomena.

A unique Langley marine research capability of coupled lab spectral signature, field test, data processing algorithm and display and predictive model research has been demonstrated. The long-range Langley program will provide the technology base for design of future integrated remote sensing systems for quantitatively identifying, mapping, and predicting the fate of ocean dumped materials, oil spills, estuarine and coastal sediments and other pollutants; and for monitoring the coastal environment for phytoplanktonic activity, temperature and salinity.

TECHNOLOGY UTILIZATION

13 Permanent Positions (Civil Service)

The overall objective of the NASA Technology Utilization program is to enhance economic growth through the transfer of new technology resulting from aeronautical and space research and development efforts to the non-aerospace segments of the economy.

In FY 1979, civil service personnel will provide the following support:

1. Expedite the application of new technology by compressing the time required from generation of technology to its use in the economy.

2. Encourage the use of aerospace technology in non-aerospace segments of the economy having problems amenable to technological solutions.

3. Understand more fully the technology transfer process and its impact and systematically manage and optimize the process.

AERONAUTICAL RESEARCH AND TECHNOLOGY

1,444 Permanent Positions (Civil Service)

The Aeronautics program at Langley is characterized by the dynamic interaction between a broad spectrum of technical disciplines, the application of discipline research to specific technology requirements, demonstrations of particular technology applications and the in-depth look ahead to future technology requirements. The diversity of activities in such disciplines as materials, structures, flight stability and control, avionics, and aerodynamics provides the expertise to pursue the broader problems such as those involved in the terminal configured vehicle and aircraft energy efficiency technology programs. The unique wind-tunnel and computing facilities at Langley compliment the expertise of the technical staff to produce a broad cohesive program in aeronautical research.

The Aerodynamics activity at Langley encompasses extensive theoretical, experimental, and applications activities. The more basic work in fluid and flight mechanics involves theoretical and experimental determination of aerodynamic flows and complex aircraft motions. The program utilizes the unique Langley capabilities made possible by the STAR Computer and recently developed cryogenic tunnel testing techniques. All aspects of the problems are studied including airfoil design, flowfield analysis, configuration design processes, noise analysis, propulsion system integration, fuel efficiency, and economic feasibility. In 1979, cryogenic tunnel testing techniques will be further enhanced by the development of a magnetic balance. Emphasis will be placed on combining technology developed for attitude control of models and the technology of superconducting coils into a single advanced model suspension system. The STAR Computer will be used in the areas of far-field jet noise, 3-D potential flow programs, and in the solution of 2-D and axisymmetric Navier-Stokes equation. Generation and documentation of the aerodynamic behavior of new airfoils will be furthered by the definition of the complete aerodynamic characteristics of a second family of supercritical airfoils. Wind-tunnel and flight tests will be conducted on general-aviation aircraft configurations having the potential for practical stall immunity and means for spin avoidance. An improved data base for the aircraft noise prediction computer program will be developed so that noise contours can be predicted within 1.5dB accuracy. General-aviation propellers will be designed and flight tested in order to provide correlation with wind-tunnel propeller noise data. Major activities in the area of Aircraft Energy Efficiency technology include initiation of work leading to the detailed design and testing of a laminar flow control wing box, cover panel and related ducting, and to the design of a laminar flow control compatible supercritical airfoil section for flight test evaluation; the establishment of design data for high aspect ratio supercritical wings; investigations of high-lift aerodynamics configurations for advanced transports; and the evaluation of performance benefits achievable by incorporating winglets and wing tip

extensions to wide body transports. Applications of this technology are also found to improve mission performance for advanced maneuvering air combat aircraft and missile systems and the investigation of supersonic and hypersonic configuration concepts. In the area of supersonic configurations, improved aerodynamic platforms will be experimentally determined by subsonic, transonic, and supersonic wind tunnel tests and investigations will be performed to determine the application of titanium superplastic foaming and diffusion bonding techniques to large airframe components to achieve weight and manufacturing cost reductions.

The Materials and Structures effort is pursuing the development of new and improved materials and manufacturing processes to improve life times, reliability and structural efficiency in aircraft materials. This activity also encompasses the analysis, design, structural behavior and control, life prediction and performance of aircraft structures over the spectrum of operational conditions.

The Avionics work at Langley includes technology development in aircraft guidance and navigation, the development of improved aircraft antennas, highly reliable aircraft computers, and the development of flight management techniques required by government and industry for air transportation systems in the 1980's time period. The work includes a requirements analysis, design studies, systems and component development, ground simulation and flight validation. The Langley expertise in this area is being applied to terminal configured vehicle systems technology, an advanced technology activity focused on conventional takeoff and landing transport aircraft for operating in reduced weather minima in the future high density terminal areas equipped with new landing systems, navigational aids and surveillance capabilities being developed by the Federal Aviation Administration. Emphasis in 1979 will be on improved 4-D automatic control for microwave landing system utilization on complex approach paths, and investigations of the capacity, efficiency, and safety potential of cockpit display of traffic information concepts with elements of an advanced air traffic control system. Applications of the technology are also found in work on advance digital flight control systems, the application of fluidics technology to instrumentation for general aviation aircraft and flight control systems for advanced aircraft.

The long range study activities develop improved analysis techniques for assessing future air cargo growth, advanced systems concepts, air/ground mode integration, and alternative fuels. One target for 1979 is to identify and evaluate at least two alternative approaches to significantly reducing the cost of air cargo transportation including speed-cost tradeoffs (e.g., turboprops) and simplified design.

SPACE RESEARCH AND TECHNOLOGY

575 Permanent Positions (Civil Service)

The Space Research and Technology program at Langley is characterized by work in several discipline areas and the application of this discipline expertise to current and future technology requirements. Longer range studies are directed at defining the technology requirements for future space systems and missions.

The objectives in the materials area are to establish and demonstrate the technology of advanced materials and manufacturing processes for future space vehicles; to improve materials and techniques for longer-lived, more reliable spacecraft; and to provide thermal protection systems technology simulation tests and test facilities for Space Shuttle and advanced Earth orbital vehicles. This research identifies and predicts mechanisms of mechanical property degradation, suitable operating conditions, and modifications for improving properties of advanced space materials. Additional studies are providing spacecraft designers with up-to-date knowledge of the Earth orbital meteoroid and man-made debris environment. In 1979, as part of the materials program, Langley will demonstrate a 1000°F graphite/glass composite having 30 percent higher specific strength and stiffness than titanium composites.

The goal of activities in the area of Structures is to determine probable cost and operational effectiveness of concepts for large areas, lightweight, erectable space structures needed for antennas, arrays, and reflectors. Automated analysis and design methods for development of the entire spectrum of aerospace structures have been developed and undergo constant improvements (NASTRAN). Ground test facilities are maintained, operated, and improved to develop, evaluate, and validate full-size thermal/structural concepts for space transportation systems. Fatigue life, fracture strength, and failure modes of composite materials and structures and the relevant parameters which control such failures are being analyzed. These theoretical and experimental efforts are providing capabilities for development and design of efficient, reliable, and cost effective space vehicle structures. As part of the structures activities, Langley will develop by 1979 vehicle/payload dynamic prediction techniques within margins of 10 percent for low-frequency dynamics.

An extensive program in electronic component development, data processing and sensor development is conducted at Langley. Sensor developments include laser back scatter and fluorescence techniques for water quality measurements, continuously tuneable infrared laser techniques, and high power/high pressure tuneable gas lasers for the measurement of low concentration atmospheric constituents. In 1979 Langley will demonstrate the reliability of tuneable laser diodes to meet the requirements of the solar occultation Laser Heterodyne Spectrometer experiment to measure stratospheric constituents in the 9-12 μ m region, and will design and evaluate an array of microwave radiometer receivers for high-resolution (~1 km) oceanographic sensing. Specific devices required to support the development of a charged coupled device onboard data processor are being developed and evaluated. The broad objective of this work is to develop an onboard processor technology base for remote sensing vehicles with the potential of leading to a 1000-fold decrease in the density of data sent back to Earth processing stations. The development of a solid state data storage system using bubble domain technology is underway at Langley. The overall objective is to provide an adequate bit solid state data storage system suitable for replacing tape recorders in many aerospace vehicle applications.

The objectives of the Langley program in entry technology are to develop the aerothermodynamic technology required for the design and operation of advanced vehicle systems for space and global transportation, to develop the technology base to assure survival and reliable performance of scientific probes during entry into planetary atmospheres and to provide space shuttle development support. The objectives are being met through the application of analytical techniques and unique Langley facilities in the areas of Earth orbit transportation, aerodynamics, heat transfer, real gas effects, planetary entry, radiative heating and hypervelocity gas dynamics. In 1979 theoretical and experimental efforts in the areas of ablation product radiation and absorption, highly blown shock layer probe flight mechanics, and mass loss and shape change will be pursued to develop a sufficient data base to minimize planetary mission cost, maximize scientific return and ensure a high probability of mission success.

The Langley programs in Space Technology Shuttle Payloads involve a variety of tasks focused on extending basic research and technology development into the space environment when economically feasible, and/or when the objectives can be achieved only in space. Space Technology programs are continually reviewed, areas which can benefit from access to space testing are identified, conceptual studies are conducted for experiments which can perform the identified space testing, and the planning of resource requirements, management and other factors critical to the approval of projects to implement identified experiments are also performed. In 1979, Langley will deliver the Long Duration Exposure Facility with 35 experiments onboard to the launch site for integration with the shuttle.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

750 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or services being provided to all Langley Research Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director, and immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities
 Data processing and computer support
 Reliability and quality assurance
 Centerwide security and protection
 Fire protection
 Custodial services
 Logistics support including transportation, supplies, etc
 Medical care of employees
 Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1977 Actual	1978 Budget Current Estimate Estimate (Thousands of Dollars)		1979 Budget Estimate
I <u>PERSONNEL AND RELATED COSTS</u>	<u>80,314</u>	<u>79,986</u>	<u>85,456</u>	<u>85,568</u>

Basis of Fund Requirements

A Compensation and benefits

1 Compensation

a. Permanent positions.....	71,490	70,498	75,635	75,573
b. Nonpermanent.....	856	1,187	1,064	1,126
c. Reimbursable detailees.....	27	32	34	34
d. Overtime and other compensation.....	314	<u>510</u>	<u>425</u>	<u>510</u>

Subtotal, Compensation.	72,687	72,227	77,158	77,243
-------------------------	--------	--------	--------	--------

2. Benefits.....	<u>7,113</u>	<u>7,166</u>	<u>7,775</u>	<u>7,693</u>
------------------	--------------	--------------	--------------	--------------

Subtotal, Compensation and Benefits	<u>79,800</u>	<u>79,393</u>	<u>84,933</u>	<u>84,936</u>
-------------------------------------	---------------	---------------	---------------	---------------

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1979 <u>Budget Estimate</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	60	89	59	95
2. Personnel training.....	<u>454</u>	<u>504</u>	<u>464</u>	<u>537</u>
Subtotal, Supporting Costs.....	<u>514</u>	<u>593</u>	<u>523</u>	<u>632</u>
Total, Personnel and Related Costs.....	<u>80,314</u>	<u>79,986</u>	<u>85,456</u>	<u>85,568</u>
A. <u>Compensation and Benefits</u>	<u>79,800</u>	<u>79,393</u>	<u>84,933</u>	<u>84,936</u>
1. <u>Compensation</u>	<u>72,687</u>	<u>72,227</u>	<u>77,158</u>	<u>77,243</u>
a. Permanent positions.	71,490	70,498	75,635	75,573

The funds shown above will support 3,069 permanent positions in 1979. Permanent personnel staffing during 1979 will continue at the same level as 1978 which is 96 below the 1978 budget estimate.

Basis of Cost for Permanent Positions

In 1979 the cost of permanent positions will be \$75,573,000. This decrease results from the following:

Cost of permanent positions in 1978.....	75,635
Cost increase in 1979.....	+1,601
Within grade advances and career development	
Full year effect of 1978 actions.....	+701
Partial year effect of 1979 actions.....	+771
Full year effect of 1978 pay increase	+129

Cost decreases in FY 1979.....	-1 663
Turnover savings and abolished positions:	
Full year effect of FY 1978 actions.....	-724
Partial year effect of 1979 actions.....	-939
Cost of permanent positions in FY 1979.....	75

b. Nonpermanent positions

	1977 Actual	1978 Budget Estimate (Thousands of Dollars)	1978 Current Estimate	1979 Budget Estimate
1. Cost.....	856	1,187	1,064	1,126
2. Workyears.....	107	144	130	135

The 1979 plan includes 135 workyears which is an increase over the 1978 current estimate. The 1979 estimate reflects a slight increase over 1978 in the Cooperative Training, Youth Opportunity, and Summer programs. This effort will support the following programs as shown:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.....	75
Summer programs.....	20
Youth opportunity programs.....	30
Other temporaries.....	10
Total ..	<u>135</u>

	<u>1977</u>	<u>1978</u>		<u>1979</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
c. Reimbursable detailees,	27	32	34	34

The current estimate for 1979 includes funding for the services of one experienced Navy test pilot who will participate in experimental flight programs including spin tests on military aircraft and flights of terminal configured vehicles.

d. Overtime and other compensation.....	314	510	425	510
---	-----	-----	-----	-----

The use of overtime and other compensation is limited to emergency repairs and work that cannot be accomplished during normal working hours. This includes the monitoring of on-site contracts being performed during off-duty hours and wind tunnel work required at night to take advantage of off-peak rates. The increase in the 1979 estimate reflects overtime associated with the transfer of the Long Duration Exposure Facility experiments to KSC for checkout and launch.

2. <u>Benefits</u>	<u>7,113</u>	<u>7,166</u>	<u>7,775</u>	<u>7,693</u>
--------------------------	--------------	--------------	--------------	--------------

Following are the amounts of contribution by category:

Category of Costs

Civil Service Retirement Fund....	5,021	4,971	5,314	5,305
Employee life insurance.....	315	335	339	340
Employee health insurance.....	1,467	1,507	1,649	1,678
Workmen's compensation.	161	275	275	289
FICA.....	13	32	25	28
Incentive awards.....	136	45	53	53
Other benefits.....	---	1	---	---
Severance pay.....	---	---	120	---
Total.	<u>7,113</u>	<u>7,166</u>	<u>7,775</u>	<u>7,693</u>

The increase from the 1978 budget estimate to the current estimate is due to the 1978 pay increases and the inclusion of severance pay.

The decrease in 1979 from the 1978 current estimate results from no requirement for severance pay.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
B. <u>Supporting Costs</u>	<u>514</u>	<u>593</u>	<u>523</u>	<u>632</u>
1. Transfer of personnel	60	83	59	95

Transfer of personnel costs include actual expenses involved in the movement and temporary storage of employees' household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses. The increase of 1979 over 1978 reflects the costs associated with anticipated increase in hiring when the 1978 personnel reductions are achieved.

2. Personnel training	454	504	464	537
-----------------------------	-----	-----	-----	-----

Expenses include fees, tuition, and related costs for off-site training and the costs of seminars and workshops. The estimated increase in cost from 1978 to 1979 reflects a slightly increased training plan to provide employees with technological expertise to keep abreast of the state of the art in their respective fields. The 1979 estimate also reflects announced increases for tuition and related training expenses.

TRAVEL

11. <u>TRAVEL</u>	<u>1,887</u>	<u>2,066</u>	<u>1,999</u>	<u>2,156</u>
-------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Program Travel	1,389	1,539	1,365	1,435
B. Scientific and Technical Development	182	113	200	250
C. Management and Operations Travel.....	<u>316</u>	<u>414</u>	<u>434</u>	<u>471</u>
Total, Travel.....	<u>1,887</u>	<u>2,066</u>	<u>1,999</u>	<u>2,156</u>

	1977 <u>Actual</u>	1978 <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		1979 <u>Budget Estimate</u>
A. <u>Program Travel</u>	<u>1,389</u>	<u>1,539</u>	<u>1,365</u>	<u>1,435</u>

Program travel is directly related to the accomplishment of the Center's mission and accounts for 67 percent of the travel budget for 1979. Travel for program purposes reflects the continuing effort in space research, aircraft technology, flight simulation, fluid mechanics, airborne science and applications, and space life sciences. The decrease between the 1978 budget estimate and current estimate is a result of an overall travel reduction combined with an increase for Scientific and Technical Development travel. The increase from the 1978 current estimate to the 1979 budget estimate reflects the level of program activity at the Center.

B. <u>Scientific and Technical Development</u>	<u>182</u>	<u>113</u>	<u>200</u>	<u>250</u>
--	------------	------------	------------	------------

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside LaRC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. The increase in the 1978 current estimate to the 1979 budget estimate reflects the need to provide those employees with technological expertise the opportunities necessary to keep abreast of the latest state-of-the-art in their respective fields.

C. <u>Management and Operations Travel</u>	<u>316</u>	<u>414</u>	<u>434</u>	<u>471</u>
--	------------	------------	------------	------------

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The increase in the 1978 current estimate and 1979 budget estimate is due primarily to the negotiated rate increase in the local transportation contract.

FACILITIES SERVICES

Langley Research Center (LaRC) is located on 787 acres of grounds in a complex made up of laboratory and office type buildings as well as research wind tunnels.

This complex encompasses 2,000,000 gross square feet of building space including 11 major buildings. Also included are some 18 major technical facilities. This physical plant houses an average daily on-Center population of 4,200 to 4,500 personnel. Many of the test facilities are utilized on more than one shift/or during off peak hours.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
III <u>FACILITIES SERVICES</u>	<u>7,508</u>	<u>6,374</u>	<u>8,237</u>	9

Basis of Fund Requirements

A Maintenance and Related Services

1 Facilities	381	530	308	339
--------------	-----	-----	-----	-----

B Custodial Services.....	1,581	1,260	1,443	1,958
---------------------------	-------	-------	-------	-------

C Utility Services.....	5	<u>4,584</u>	<u>6,486</u>	<u>7,024</u>
-------------------------	---	--------------	--------------	--------------

Total, Facilities Services.....		<u>6,374</u>	<u>8,237</u>	<u>9,321</u>
---------------------------------	--	--------------	--------------	--------------

A Maintenance and Related Services

1 Facilities.....	<u>381</u>	<u>530</u>	<u>308</u>	<u>339</u>
-------------------	------------	------------	------------	------------

This activity provides for 12 workyears of effort to accomplish facility maintenance and repair. The increase in the 1979 request provides for negotiated support contractor wage rate increases of maintenance provided in 1978.

B <u>Custodial Services</u>	<u>1,581</u>	<u>1,260</u>	<u>43</u>	<u>1,958</u>
-----------------------------------	--------------	--------------	-----------	--------------

This activity involves 117 workyears of effort at LaRC to provide for janitorial, fire protection, and security services. The 1979 estimate provides for negotiated wage rate increases in support contract costs for janitorial and security guard services. The 1979 estimate also reflects the full year funding for the janitorial contract.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Utilities Services</u>	<u>5,546</u>	<u>4,584</u>	<u>6,486</u>	<u>7,024</u>

Included in this item is the purchase of electric service from VEPCO, fuel oil from a local supplier, and water and sewage charges. Also included are funds to procure steam services from the USAF-Langley in Air Force-owned facilities which NASA personnel occupy under a permit agreement.

A breakdown of the utilities costs are as follows:

1. Electricity (157,000 mWh)	5,574
2. Fuel oil (2,755,000 gals.)	1,147
3. Steam (USAF)	229
4. Water and sewage	<u>74</u>

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u>	<u>1,514</u>	<u>1,572</u>	<u>1,721</u>	<u>1,825</u>
-------------------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment.	71	28	94	101
2. Operations	<u>1,081</u>	<u>1,191</u>	<u>1,230</u>	<u>1,311</u>
<u>Subtotal</u>	<u>1,152</u>	<u>1,219</u>	<u>1,324</u>	<u>1,412</u>

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
B. <u>Scientific and Technical Information</u>				
1. Library.....	73	64	78	85
2. Education and information.....	<u>289</u>	<u>289</u>	<u>319</u>	<u>328</u>
Subtotal.....	<u>362</u>	<u>353</u>	<u>397</u>	<u>413</u>
Total, Technical Services.....	<u>1,514</u>	<u>1,572</u>	<u>1,721</u>	<u>1,825</u>
A, <u>Automatic Data Processing</u>	<u>1,152</u>	<u>1,219</u>	<u>1,324</u>	<u>1,412</u>

Funds for the Center's business computer complex which provides the accounting and management information data required by the Center and Agency are provided for in this function. Included are equipment lease, purchase and maintenance; paper and other expendable supplies; small miscellaneous contracts; and a 33 workyear level of effort support service contract for programming and operations,

1. Equipment	71	28	94	101
--------------------	----	----	----	-----

This activity includes the lease and purchase of equipment associated with Langley's business computer complex. The increase in 1979 reflects the full year effect of rate increases in 1978 with services at the current level 1.

2. Operations	1,081	1,191	1,230	1,311
---------------------	-------	-------	-------	-------

This estimate includes ADP equipment maintenance, supplies, and the support service contract for programming and operations. The increase in 1979 over the 1978 current estimate provides for the full year effect of a previously negotiated increase in the program and operations contract.

B. <u>Scientific and Technical Information</u>	<u>362</u>	<u>353</u>	<u>397</u>	<u>413</u>
--	------------	------------	------------	------------

This estimate includes the purchase of books, materials, and supplies for, and the operation of the technical library; and also provides for public information services and for the exhibit and operation of the visitor information center.

	1977 <u>Actual</u>	<u>1978</u> Budget Estimate Current Estimate (Thousands of Dollars)		1979 Budget Estimate
1. Library	73	64	78	85

Six workyears of support contract effort are for the operation of the Center's technical library. The 1979 estimate reflects an increase for the full year effect of a previously negotiated contract at the same level of effort provided in 1978.

2. Education and information.....	289	289	319	328
-----------------------------------	-----	-----	-----	-----

Funding for all the Center's public affairs activities is included in this estimate. Included are operation of the visitor center; coordination of tours and special events; construction and transportation of exhibits; and other miscellaneous educational and information programs. The 1979 estimate reflects the same level of service provided in 1978 with a slight increase to reflect the full year impact of rate increases.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>4,374</u>	<u>5,413</u>	<u>5,176</u>	<u>5,709</u>
---	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Administrative Communications.....	1,423	2,108	1,954	2,147
B. Printing and Reproduction	129	192	148	159
C. Transportation.....	1,143	1,227	1,225	1,337
D. Installation Common Services.....	<u>1,679</u>	<u>1,886</u>	1,849	2,066
Total, Management and Operations,	<u>4,374</u>	<u>5,413</u>	<u>5,176</u>	5,709

	<u>1977 Actual</u>	<u>1978</u>		<u>1979 Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Administrative Communications</u>	<u>1,423</u>	<u>2,108</u>	<u>1,954</u>	<u>2,147</u>

This estimate includes funds for local telephone and exchange costs; Federal Telecommunications System (FTS) service; datafax and telegraph service; and postage costs. The decrease in the 1978 current estimate reflects a revision in the administrative communications plan. The 1979 estimate reflects an increase of \$90,000 in FTS costs due to the elimination of the Interdepartmental Dialing System (IDS) and the full year effect of rate increases in the cost of other communications services.

1. Local telephone service..... 875

This estimate provides for local telephone and exchange costs. The 1979 estimate provides for the full year effect of rate increases in contractor wages.

2. Long distance telephone service..... 449

These funds provide for long distance telephone service from the FTS. The increase in 1979 reflects an increase in FTS usage caused by elimination of the Interdepartmental Dialing System (IDS).

3. Nontelephone communications..... 823

Included in this activity are costs for postage and other miscellaneous communications such as teletype and datafax services. The 1979 estimate provides for the full year effect of rate increases for these services.

B. Printing and Reproduction..... 129 192 148 159

This estimate provides for special printing and reproduction, supplies, and a four workyear support service contract effort for reproduction services. The 1979 estimate provides for the full year effect of a previously negotiated wage increase in support service contract costs, offset by a slight reduction in the purchase of supplies.

C. Transportation..... 1,143 1,227 1,225 1,337

This activity includes the operation, maintenance, and purchase of motor vehicles; shipping transportation and freight charges; a 24 workyear support service contract effort for pickup and delivery of freight, furniture, and other bulk objects; and a nine workyear support service contract for operation and maintenance of

the NASA-1 aircraft. This effort also includes all of the NASA-1 aircraft fuel, equipment, and expendable supplies. The 1979 estimate provides for the full year effect of a previously negotiated wage increase in support contractor costs and the full year effect of rate increases for other services.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands	of Dollars)	
D. <u>Installation Common Services</u>	<u>1,679</u>	<u>1,886</u>	<u>1,849</u>	<u>2,066</u>

These funds will provide for 71 workyears of support service contract effort for medical services, mail delivery, stock issue and warehousing, and other general administrative support. Also included are the rental and maintenance of office copy machines and equipment, minority programs, and other administrative services and supplies. The 1979 estimate provides for a three workyear increase in support contractor effort in addition to the full year effect of a previously negotiated increase in support service contract costs at the same level of effort provided in 1978,

1. Center management and staff..... 316

This function includes thirteen workyears of support service contract effort and general supplies and equipment purchases for all administrative support organizations at the Center. The 1979 estimate reflects an increase of three workyears for support contractor services, offset by reductions in supplies and equipment purchases,

2. Medical services..... 457

Twelve workyears of effort in the Center's occupational and environmental health services provide dispensary services, emergency ambulance service, medical examinations, health physics and industrial hygiene services are provided for in this activity. The 1979 estimate provides for the full year effect of a previously negotiated increase in the cost of support contractor medical services.

3. Installation support services..... 1,293

This function includes 46 workyears of support service contract effort for mail delivery and stockissuance and warehousing operations. Also included are the purchase, maintenance, and rental of office copy machines, typewriters and other office equipment, and many of the Center's minority related programs. The 1979 estimate provides for the full year effect of a previously negotiated increase in cost of support contractors and continued level of effort in other services,

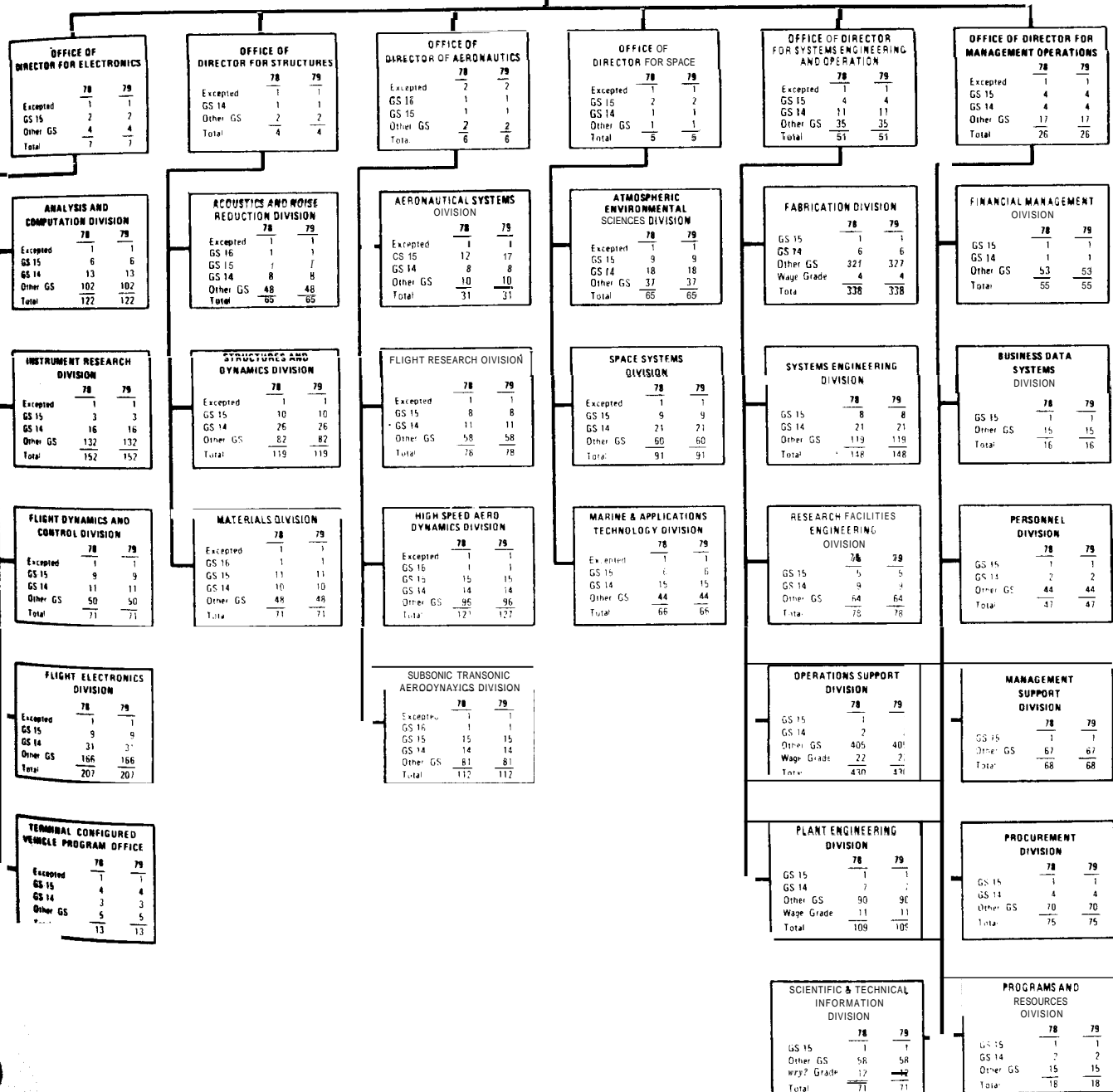
LANGLEY RESEARCH CENTER

RPM 9-23

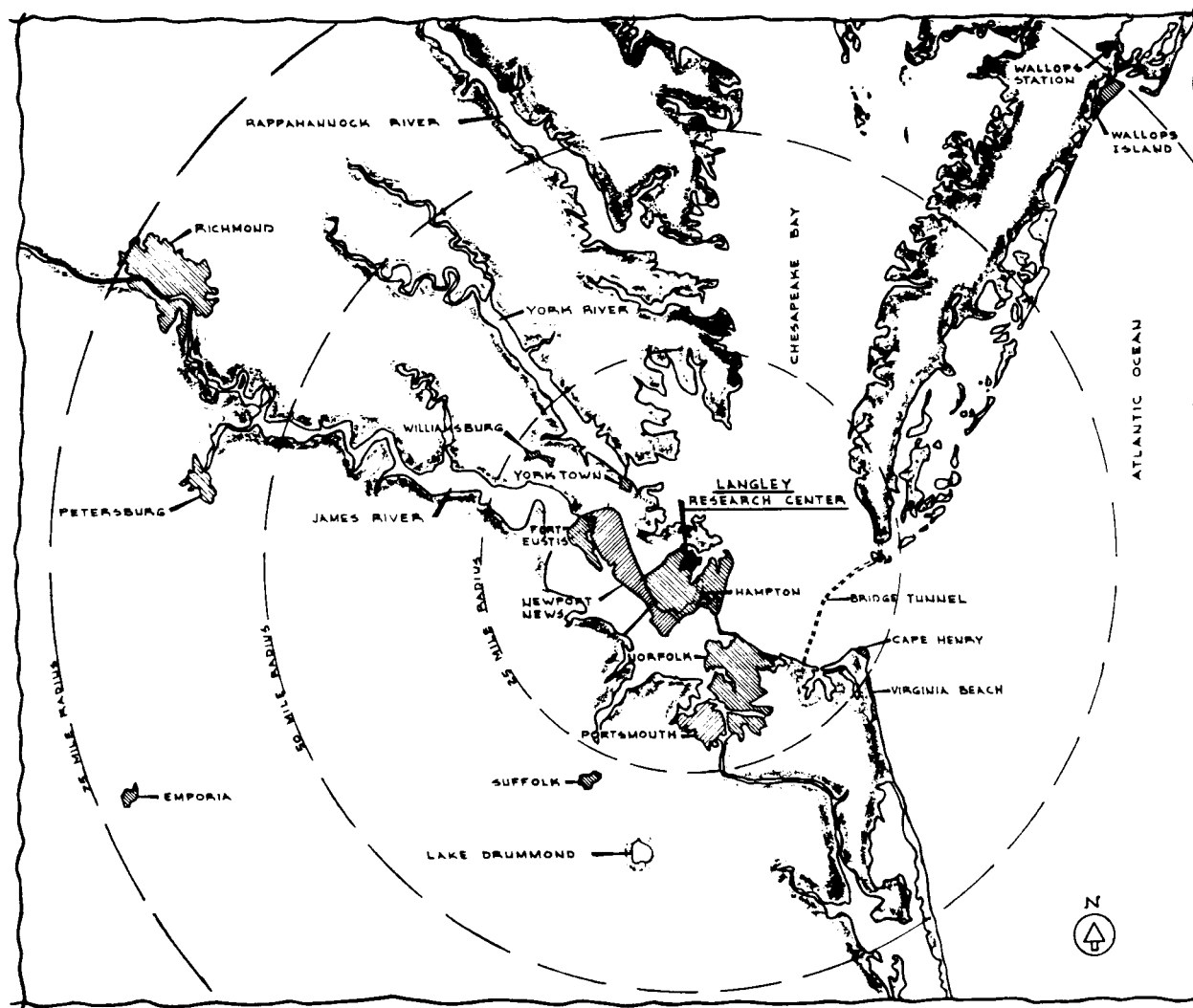
STAFFING SUMMARY		
	78	79
Excepted	29	29
GS 16	6	6
GS 15	180	180
GS 14	306	306
Other GS	2439	2439
Wage Grade	49	49
Total	3069	3069

OFFICE OF DIRECTOR		
	78	79
Excepted	6	6
GS 16	1	1
GS 15	1	1
Other GS	21	21
Total	29	29

OFFICE OF DIRECTOR FOR PROJECTS		
	78	79
Excepted	1	1
GS 16	1	1
GS 15	10	10
GS 14	15	15
Other GS	71	71
Total	98	98

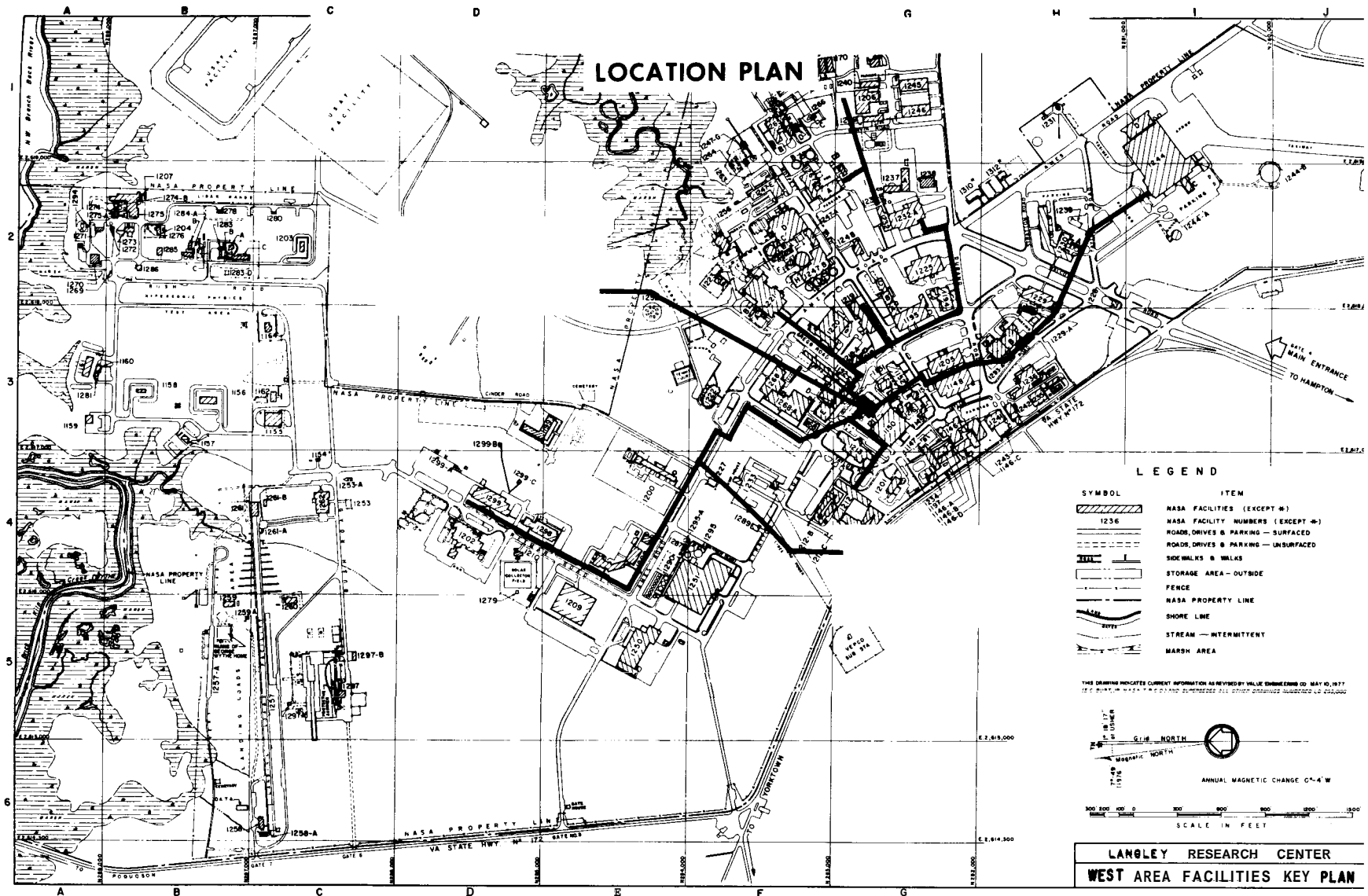


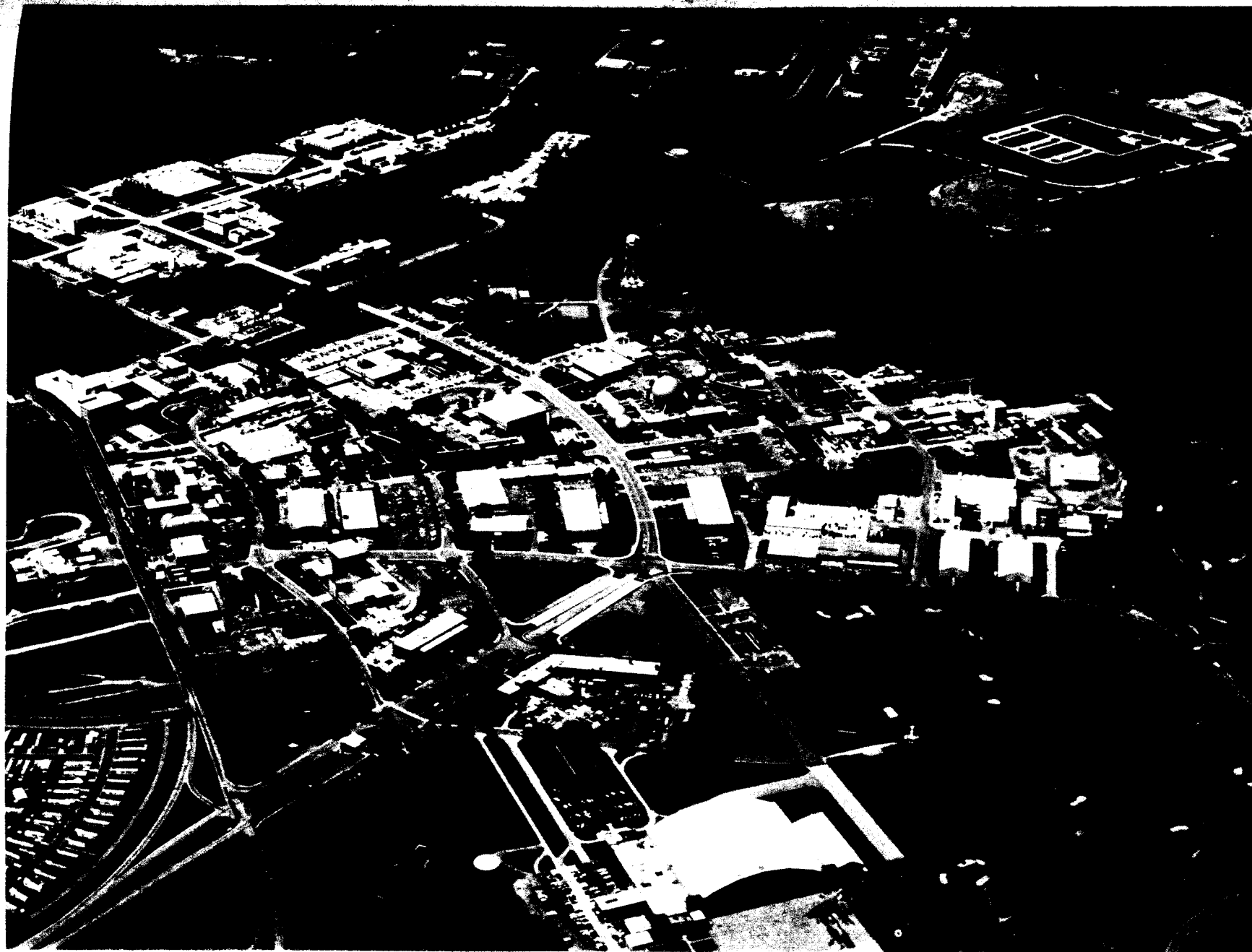
NASA
L-65-8996



LANGLEY RESEARCH CENTER AND VICINITY

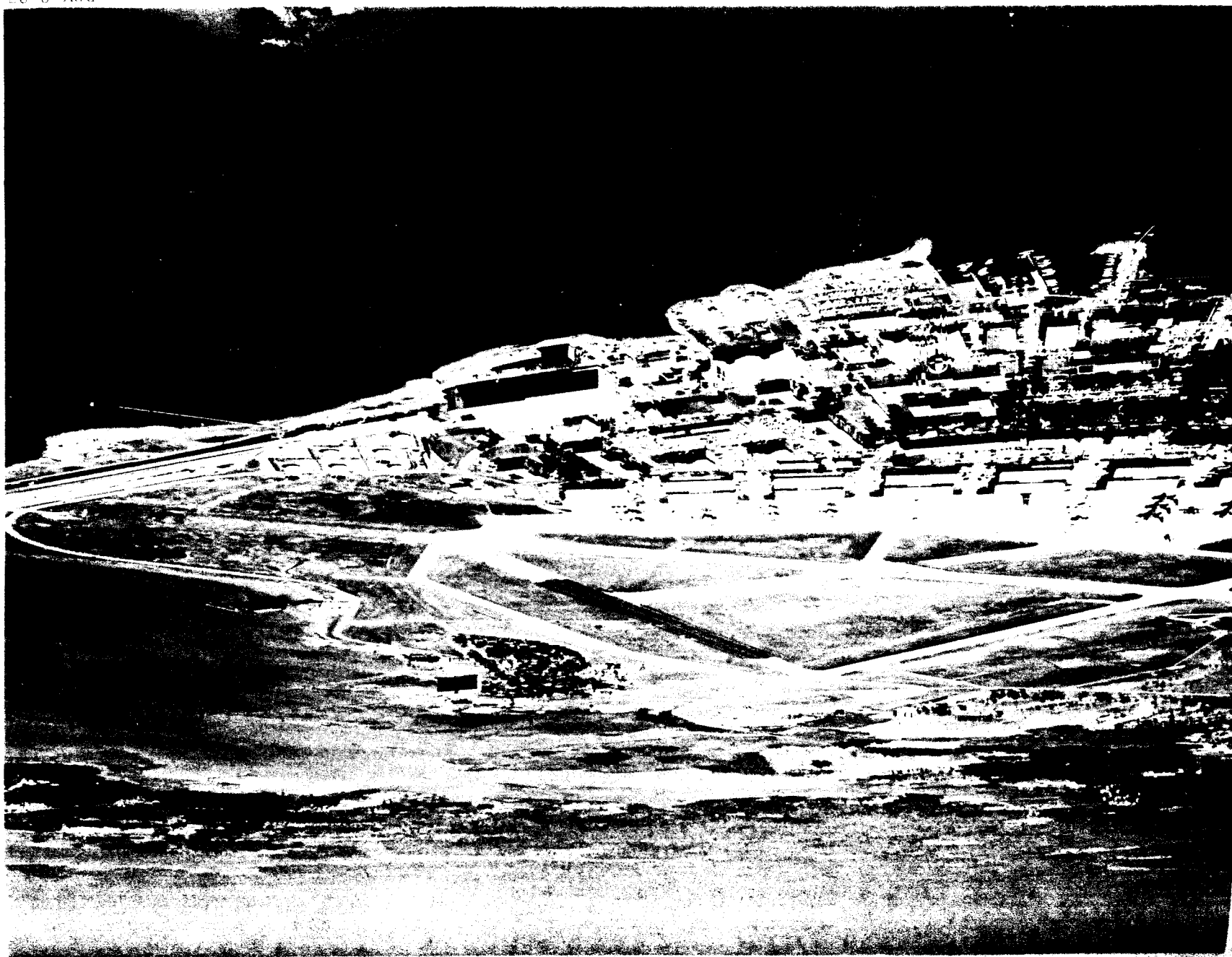
LANGLEY RESEARCH CENTER FISCAL YEAR 1979 ESTIMATES





RPM 9-26

RPM 9-27



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

LEWIS RESEARCH CENTER

DESCRIPTION

The Lewis Research Center occupies two sites in north central Ohio. The older one, established in 1941 adjacent to the Cleveland-Hopkins International Airport, has 366 acres including 14 acres leased from the City of Cleveland. There are over 100 buildings, including wind tunnels, test chambers, laboratories and other research facilities.

The Plum Brook Station established in 1956, is located south of Sandusky, Ohio, about fifty miles west of Cleveland, on land formerly occupied by the Plum Brook Ordnance works. There are 8,051 acres owned and an additional 47 acres in easements. There are 83 buildings and 99 concrete storage bunkers. A 100 kW Electric Wind Turbine Generator Facility designed to be operated remotely is in operation for a program jointly sponsored by the Energy Research and Development Administration and NASA. During 1975, consistent with our future research and technology needs, the principal facilities were placed in a standby mode.

The total capital investment of the Lewis Research Center and the Plum Brook Station, including fixed assets in progress and contractor-held facilities at various locations as of September 30, 1977, was \$428,253,000.

CENTER ROLES AND MISSIONS

The Lewis Research Center was established in 1941 as an aircraft engine research laboratory to meet the immediate needs at that time to develop superior aircraft propulsion systems. Since then, Lewis has developed and constructed many outstanding facilities for testing full-scale aircraft engines and engine components. The results of Lewis expertise have been incorporated in many aircraft engine designs. The Lewis program is directed at both military and civilian applications. The principal and supporting roles are:

PRINCIPAL

Air Breathing Propulsion Systems - development of a technology base to advance the state of the art in aeronautical, propulsion systems, including internal engine noise reduction, high temperature materials and structures and providing technical support to military aviation.

Launch Vehicle Procurement - development and procurement of Centaur launch vehicle system for science/ applications mission.

Space Propulsion Systems Technology - development and maintenance of the space propulsion systems technology base, including associated structures and materials work.

Space Energy Processes and Systems Technology - development and maintenance of technology base, including associated structures and materials work.

Energy Technology and Applications - conducting energy-related research and development, primarily on a reimbursable basis, with broad emphasis on solar, gas turbine, ground propulsion, and other appropriate terrestrial energy systems.

SUPPORTING

High Power Communications - development of high power communications technology, including high power microwave and millimeter-wave components and systems oriented towards satellite-based applications. Includes flight experiment development and management.

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FUNDS</u>		<u>1978</u>		<u>1979</u>
	<u>1977</u>		<u>Budget</u>	<u>Current</u>	<u>Budget</u>
	<u>Actual</u>		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
			(Thousands of Dollars)		
I. Personnel and Related Costs.....	71,943		76,745	79,854	80,253
II. Travel.....	1,007		1,105	1,066	1,187
III. Facilities Services.....	8,051		8,328	7,595	9,705
IV. Technical Services.....	955		699	466	565
V. Management and Operations	<u>1,862</u>		<u>1,829</u>	<u>1,780</u>	<u>2,070</u>
Total, fund requirements	<u>83,818</u>		<u>88,706</u>	<u>90,761</u>	<u>93,780</u>

Distribution of Permanent Positions by Program

	<u>1977</u> <u>Actual</u>	<u>1978</u> Budget <u>Estimate</u>	Current <u>Estimate</u>	1979 Budget <u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>178</u>	<u>170</u>	<u>136</u>	<u>129</u>
Expendable launch vehicles.. ..	178	170	136	129
<u>Space Sciences</u>	<u>27</u>	<u>29</u>	<u>27</u>	<u>---</u>
Physics and astronomy.....	27	29	27	---
<u>Space and Terrestrial Applications</u>	<u>133</u>	<u>114</u>	<u>133</u>	<u>133</u>
Space applications	127	107	127	127
Technology utilization... ..	6	7	6	6
<u>Aeronautics and Space Technology</u>	<u>2,070</u>	<u>2,122</u>	<u>2,057</u>	<u>2,091</u>
Aeronautics research and technology.. ..	1,259	1,313	1,393	1,427
Space research and technology.....	505	514	314	314
Energy technology applications.....	<u>306</u>	<u>295</u>	<u>350</u>	<u>350</u>
Subtotal, direct positions	2,408	2,435	2,353	2,353
<u>Center Management and Operations Support Positions</u>	<u>590</u>	<u>590</u>	<u>585</u>	<u>585</u>
Total, permanent positions	<u>2,998</u>	<u>3,025</u>	<u>2,938</u>	<u>2,938</u>

PROGRAM DESCRIPTION

EXPENDABLE LAUNCH VEHICLES

129 Permanent Positions (Civil Service)

The Centaur Launch Vehicle program provides launch vehicles and launch operations for automated space missions. The program includes the procurement of vehicle systems hardware, launch services, engineering and management support as well as maintenance and operation of ground support equipment.

In 1979, civil service personnel working on the Centaur Launch Vehicle program will continue to support the launching of both government and commercial payloads. Currently, four Atlas-Centaur launches are scheduled in support of the High-Energy Astronomical Observatory (HEAO) program and the Navy FLTSATCOM and INTELSAT V program for COMSAT.

SPACE APPLICATIONS

127 Permanent Positions (Civil Service)

Space Applications at Lewis Research Center consists of two supporting roles to NASA's program: communications and remote sensing for terrestrial applications. In 1979, Lewis civil service personnel will continue to support these programs as follows:

Communications - Lewis is studying the capabilities and costs of various advanced satellite communications systems concepts directed at providing improved communication service. The studies are being focused on the needs of the public and private sectors both nationally and internationally. Lewis is working on experimental systems with possible application to both the ground and space segments of any future advanced communications systems. Presently orbiting the earth is the joint U. S./Canadian Communications Technology Satellite, which utilizes a high power transmitter developed by Lewis. In 1979, Lewis will continue to support the operations and experiments of this satellite.

Remote Sensing - Carrying out Lewis' role of applying NASA's technology to regional needs, Lewis is developing and applying this technology to important areas of remote sensing of earth surface characteristics. Lewis has successfully demonstrated - and its technology is in use at present - an all-weather radar remote sensor for surveillance of lake ice in the Great Lakes, sea ice and icebergs, and vessels. In 1979, automatic target recognition techniques will be further developed to allow improved automated real time discrimination of all target data. Lewis is presently assisting communities in the thermal scan of cities to determine the heat loss of structures and buildings for the purpose of encouraging reduced consumption of our Nation's energy resources. The thermal scanning techniques are also being applied to the real time determination of ocean-surface temperatures by remote (airplane or satellite borne) sensors.

Program milestones for 1979 include demonstrating the Radar Image processor for earth observation measurements, completing Nimbus G coastal zone color scanner algorithm, and in the area of High Frequency Communications, continue development of prototype items such as the traveling wave tube amplifier.

TECHNOLOGY UTILIZATION

6 Permanent Positions (Civil Service)

In 1979, Lewis civil service personnel in the Technology Utilization program will be involved in transfer of new knowledge and innovative technology resulting from NASA R&D programs for application in industry, the public sector, and medicine. The primary objectives are to (1) increase the return on the national investment in aerospace R&D, (2) shorten the time from discovery to application, (3) aid the movement of new knowledge to potential users, and (4) contribute to the development of improved means of transferring the new knowledge to other places of potential applications. Examples of areas of present programs are: applications of nickel-zinc batteries (miner's caps, wheelchairs), surface texturing by ion beams (teeth implantation), automated insolation reporter (solar thermal input used by industry), material science (obliterated serial number restoration), and communications (central medical emergency dispatch).

AERONAUTICS RESEARCH AND TECHNOLOGY

1,427 Permanent Positions (Civil Service)

Lewis' major responsibility within aeronautics is aeronautical propulsion. The general goals of Lewis are to provide the advanced technology base for developing high-performance civil and military aeronautical propulsion systems which are economical, fuel-conservative, and reliable, and which operate with minimum environmental impact. The civil service personnel in 1979 will be involved in conducting the ongoing program at the Center are described below.

In aeronautical propulsion-related research the goals are to develop an understanding of the physical phenomena related to propulsion systems and components including: aeroelasticity phenomena in turbomachinery, heat

transfer within turbine blading, friction and wear phenomena, low and high temperature composite materials, fatigue failure mechanisms, emission characteristics in reciprocating and turbine engines, alternate fuels characterization, noise generation mechanisms, and integrated control concepts.

The major goal in the components technology program is to advance the state of the art in engine components including: composite fan blades, low aspect ratio compressor stages, core turbine cooling, blade clearance controls, advanced transmissions, prevaporizing combustors, two-dimensional nozzles, supersonic inlets, high-speed propellers, bearings, seals, and instrumentation.

In engine systems technology, Lewis is studying problems encountered in complete engines and propulsion systems including: engine performance at altitude, inlet flow distortion effects, dynamic component interactions, thrust augmentation, advanced control systems, techniques for reduced fuel consumption, engine emission and noise reduction, propulsion system-airframe interactions, and aviation safety technology associated with propulsion systems.

Within the aeronautics programs at Lewis, work is being performed on a number of major project areas including: materials for advanced turbine engines, energy efficient engine, quiet clean short-haul experimental engine, variable cycle engine, stratospheric cruise emission reduction, engine component improvement, quiet short-haul research aircraft, quiet clean general aviation turbo-fan, supersonic cruise research, advanced turboprops, and advanced helicopter transmissions.

SPACE RESEARCH AND TECHNOLOGY

314 Permanent Positions (Civil Service)

The major roles of the Lewis Research Center in Space Research and Technology are to advance the state-of-the-art and maintain a technology base for advanced propulsion and power systems, including associated materials and structures work and space power processing. The civil service personnel in 1979 will be used in the activities described below.

The Lewis space propulsion programs include chemical and electrical propulsion technology and component and systems development. The chemical propulsion program emphasizes advanced engine systems and components required for future space systems beyond the capability of the Space Shuttle. Improved components and methods of life prediction are being developed and demonstrated, advanced fuel-oxidant combinations are being tested, and complete engine systems tests are being conducted. Technology developments include advanced cooling techniques, fabrication techniques and materials for rocket chambers and nozzles, and advanced high pressure fuel/oxidant pumps ■

Electrical propulsion supports both primary propulsion and auxiliary propulsion applications. The primary propulsion technology program consists of further thruster performance verification tests, performance testing

of supporting power processor systems to deliver power to the thruster and its controls, and the integration and testing of complete thruster systems, including the thruster, power processor, propellant storage and distribution system, thruster gimbal mechanism, controllers', and thermal control systems. Auxiliary electric propulsion meets spacecraft requirements for maneuvering, station keeping and attitude control. The present program objectives are to verify the performance of a one-millipound thruster, develop and test thruster power systems, and perform complete system verification tests. A technology-readiness experiment is being developed for launch into orbit.

Space power generation studies include solar photovoltaic, electrochemical and mechanical (Brayton) energy conversion. The photovoltaic program is directed towards an improvement in solar cell efficiency, reduced cost, and improved operating life. Electrochemical research and development supports extended operating life and improved energy density for space batteries and fuel cell components and systems. The Brayton system development provides a technology base for thermo-mechanical power conversion systems for near term space missions. Lewis is also conducting a program to advance the state of the art of microwave power amplifiers for potential future applications in communications and power transmission.

The Lewis program in space materials technology emphasizes the development of improved materials for advanced space power generation, propulsion and communications systems. Studies include space environmental effects on superalloys and composites, and lubrication problems in mechanical components. Investigation of fundamental material properties affecting metal matrix composites, high temperature combustion corrosion, and electrochemical processes are also included.

ENERGY TECHNOLOGY APPLICATIONS

350 Permanent Positions (Civil Service)

Civil service personnel will be involved in ongoing energy research and development projects related to meeting program milestones of 1979 and subsequent years.

Lewis provides a supporting research and technology base in terrestrial energy conversion and advanced ground propulsion under sponsorship of the Department of Energy. Presently under development are large wind turbo-generators (200 to 2,000 kilowatts) to help meet public power requirements and photovoltaic power systems where their application appears practical. Other programs at Lewis supporting stationary power generation include improved coal-fired utility gas turbine and magnetohydrodynamic system studies. Energy storage systems for stationary power applications are also under development.

Ground propulsion systems development at Lewis includes advanced heat engines and electric vehicles. The major thrust of the heat engine project is to advance the technology level of the auto gas turbine and Stirling engine propulsion systems such that their application to automotive propulsion would be practical and cost

Program milestones for 1979 include completion of preliminary design of a Stirling test engine; completion of preliminary tests of a Redox flow system cell stack; and completion of fabrication and installation of a one and one-half megawatt wind turbine.

585 Permanent Positions (Civil Service)

Director and Staff - The Center Director, Deputy Director and immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Planning and Analysis, Public Affairs, Energy Management and Health and Safety.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel, who manage and conduct the affairs of the Center. Specific activities are:

KPM 10-8

PERSONNEL AND RELATED COSTS

	1977 <u>Actual</u>	<u>1978</u>		1979 <u>Budget</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS...</u>	<u>71,943</u>	<u>76,745</u>	<u>79,854</u>	<u>80,253</u>
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions	63,850	67,772	70,437	70,880
b. Nonpermanent positions	689	683	723	700
c. Overtime and other compensation	<u>815</u>	<u>968</u>	<u>894</u>	<u>1,046</u>
Subtotal, Compensation	65,354	69,423	72,054	72,626
2. <u>Benefits</u>	<u>6,269</u>	<u>6,957</u>	<u>7,413</u>	<u>7,201</u>
Subtotal, Compensation and Benefits.....	<u>71,623</u>	<u>76,380</u>	<u>79,467</u>	<u>79,827</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	22	55	62	66
2. Personnel training	<u>298</u>	<u>310</u>	<u>325</u>	<u>360</u>
Subtotal, Supporting Costs.....	<u>320</u>	<u>365</u>	<u>387</u>	<u>426</u>
Total, Personnel and Related Costs.....	<u>71,943</u>	<u>76,745</u>	<u>79,854</u>	<u>80,253</u>
A. <u>Compensation and Benefits</u>	<u>71,623</u>	<u>76,380</u>	<u>79,467</u>	<u>79,827</u>
1. <u>Compensation</u>	<u>65,354</u>	<u>69,423</u>	<u>72,054</u>	<u>72,626</u>

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
a. Permanent positions	63,850	67,772	70,437	70,880

The funds shown above will support 2,938 permanent positions in 1979, the same level as 1978.

Basis of Cost for Permanent Positions

In 1979 the cost of permanent positions will be \$70,880,000. This increase results from the following:

Cost of permanent positions in 1978.....	70,437
Cost increase in 1979.....	+1,510
Within grade advances and career development	
Full year effect of 1978 actions.....	+691
Partial year effect of 1979 actions.....	+683
Full year effect of 1978 pay increases	+71
Change in reimbursables.. ..	+65
Cost decreases in 1979.....	-1,067
Turnover savings and abolished positions:	
Full year effect of 1978.. ..	-790
Partial year effect of 1979 actions.....	-277
Cost of permanent positions in 1979.....	<u>70,880</u>
b. Nonpermanent positions	
1. cost.....	689
2. Workyears	94
	683
	98
	723
	100
	700
	98

The 1979 plan supports a relatively constant temporary program. This effort will support the following programs as shown below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training program.....	40
Summer programs.....	23
Youth opportunity programs.....	10
Other temporaries	<u>25</u>
Total.....	<u>98</u>

	1977	1978		1979
	<u>Actual.</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
c. Overtime and other compensation	815	968	894	1,046

The 1979 increase in overtime and night differential costs is related to the full year cost of 1978 pay increases.

2. Benefits	<u>6,269</u>	<u>6,957</u>	<u>7,413</u>	<u>7,201</u>
------------------------------	--------------	--------------	--------------	-------------------------

Following are the amounts of contribution by category:

Category of Costs

Civil Service Retirement Fund..	4,425	4,755	4,928	4,986
Employee life insurance..	263	278	299	305
Employee health insurance..	1,390	1,618	1,560	1,586
Workman's compensation	99	226	200	240
FICA.....	23	35	25	20
Incentive awards.....	66	40	25	60
Other benefits.....	3	5	10	4
Severance pay.....	<u>---</u>	<u>---</u>	<u>366</u>	<u>---</u>
Total.....	<u>6,269</u>	<u>6,957</u>	<u>7,413</u>	<u>7,201</u>

The reduction in 1979 is due to the decrease in severance pay.

B. <u>Supporting Costs</u>	<u>320</u>	<u>365</u>	<u>387</u>	<u>426</u>
1. Transfer of personnel	22	55	62	66

The increase in transfer of personnel in 1978 and 1979 is due to increased recruiting to meet the expanding role in Aeronautics Research and Technology.

2. Personnel training	298	310	325	360
-----------------------------	-----	-----	-----	-----

About 38% of the training cost is for technically oriented training. Another 33% is provided specifically for the scientific and engineering staff. The remaining 29% supports other programs, including administrative and clerical. Training in 1977 was reduced due to budget limitations. The 1978 and 1979 levels include funds for announced increases in tuition.

TRAVEL

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands	1978 <u>Current-</u> <u>Estimate</u> of Dollars)	1979 <u>Budget</u> <u>Estimate</u>
II. <u>TRAVEL</u>	<u>1,007</u>	<u>1,105</u>	<u>1,066</u>	<u>1,187</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel.....	847	876	891	992
B. Scientific and Technical Development.....	94	96	107	119
C. Management and Operations Travel.....	<u>66</u>	<u>133</u>	<u>68</u>	<u>76</u>
Total, Travel.....	<u>1,007</u>	<u>1,105</u>	<u>1,066</u>	<u>1,187</u>
A. <u>Program Travel</u>	<u>847</u>	<u>876</u>	<u>891</u>	<u>992</u>

Program travel is directly related to the accomplishment of the Center's mission, and accounts for 84 percent of the travel costs. It provides funds necessary to manage major contractual programs in Aeronautical Research and Technology, space propulsion, materials research and development and Energy Technology Applications. Program travel is essential to the management and procurement of the Lewis launch vehicles. The increase in 1979 is due to the increased travel anticipated to cover increased activity in the Aeronautical Research and Technology program.

B. <u>Scientific and Technical Development</u>	<u>94</u>	<u>96</u>	107	<u>119</u>
--	-----------	-----------	-----	------------

Scientific and Technical Development travel permits employees to participate in meetings and seminars with other representatives of the aerospace community. This participation allows them to benefit from exposure to

technological advances outside LeRC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government.

	1977 <u>Actual</u>	1978 Budget <u>Estimate</u> (Thousands	1978 Current <u>Estimate</u> of Dollars)	1979 Budget <u>Estimate</u>
C. <u>Management</u> and Operations Travel.....	<u>66</u>	<u>133</u>	<u>68</u>	<u>76</u>

Management and Operations Travel is required for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, procurement, travel of the Center's top management to NASA Headquarters and other NASA Centers, and local transportation.

FACILITIES SERVICES

Lewis Research Center (LeRC) occupies 366 acres of grounds and a complex of facilities made up of test and office type buildings and aircraft engine research facilities.

This complex encompasses 2,210,000 gross square feet of building space including 12 major buildings. Also included are 8 major technical facilities. This physical plant houses an average daily on-Center population of 3,000 to 3,300 personnel. Many of the test facilities are utilized on more than one shift and/or during off-peak hours.

The estimates also include certain resources associated with plant needs at its component installation, the Plum Brook Operations Division.

111. <u>FACILITIES SERVICES</u>	<u>8,051</u>	<u>8,328</u>	<u>7,595</u>	<u>9,705</u>
---------------------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Maintenance and Related Services

1. Facilities... ..	1,065	599	325	745
2. Equipment.	<u>72</u>	<u>40</u>	<u>35</u>	35
Subtotal..	1,137	639	360	780

	<u>1977</u> <u>Actual</u>	<u>1978</u> <u>Budget</u> <u>Estimate</u> (Thousands	<u>Current</u> <u>Estimate</u> of Dollars)	<u>1979</u> <u>Budget</u> <u>Estimate</u>
B. <u>Custodial Services</u>	1,417	2,031	1,684	1,980
C. <u>Utility Services</u>	<u>5.497</u>	<u>5.658</u>	<u>5.551</u>	<u>6.945</u>
Total, Facility Services.....	8.051	<u>8.328</u>	<u>7.595</u>	<u>9.705</u>
A. Maintenance and Related Services.....	1,137	<u>639</u>	<u>360</u>	<u>780</u>
1. Facilities..	1,065	599	325	745

This activity involves the LeRC facilities as well as those at Plum Brook Station. It provides for 48 workyears of effort to provide for maintenance, repair, and alterations of buildings and grounds. The increase in 1979 provides for the full year funding of the support contract.

2. Equipment	72	40	35	35
--------------------	----	----	----	----

Based on experience gained during the last half of 1977, the nonrecurring maintenance and repair of equipment costs for 1978 and 1979 are estimated at this level.

B. <u>Custodial Services</u>	<u>1.417</u>	<u>2.031</u>	<u>1.684</u>	<u>1.980</u>
------------------------------------	--------------	--------------	--------------	--------------

This activity involves 122 workyears of effort at both LeRC and Plum Brook Station to provide for security, janitorial, and fire protection services. The decrease in the 1978 current estimate from the 1978 budget estimate is due to a reduction in services. The increase in the 1979 estimate is primarily due to negotiated increases in contractor wage rates. The major services are distributed as follows:

1. Security (57 workyears)	919
2. Janitorial (65 workyears)	869
3. Other services.....	192

This activity includes rubbish disposal, fly ash removal, and industrial cleaning of walls, lights, and windows on an as needed basis.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
C. <u>Utilities Services</u>	<u>5,497</u>	<u>5,658</u>	<u>5,551</u>	<u>6,945</u>

The 1979 estimate covers the projected consumption at the Lewis Research Center and the Plum Brook Test Station. Electrical power is provided by the local utility company with locally procured fuel oil being used as a central plant fuel at both sites. Natural gas is the primary heating fuel used at Lewis with fuel oil and coal as back-up fuels depending on the market situation. Fifteen workyears of contractor effort provide for the operation of the central heating plant. The distribution of the utilities budget is as follows:

1. Electricity (174,000 MW/Hrs.)	4,820
2. Natural gas (370,000 K cu. ft.)	785
3. Fuel oil (1,000,000 gals.)	500
4. Coal (6,000 tons).	288
5. Water and Sewage	160
6. Plant operation (15 workyears)	392

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u>	<u>955</u>	<u>699</u>	<u>466</u>	<u>565</u>
-------------------------------------	------------	------------	------------	------------

Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment	52	20	20	22
2. Operations	<u>138</u>	<u>162</u>	<u>120</u>	<u>217</u>
Subtotal	<u>190</u>	<u>182</u>	<u>140</u>	<u>239</u>

		1977	1978		1979
		<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
			(Thousands of Dollars)		
B	<u>Scientific and Technical Information</u>				
	1. Library.....	38	28	30	30
	2. Education and Information.....	<u>488</u>	<u>247</u>	<u>234</u>	<u>231</u>
	Subtotal	<u>526</u>	<u>275</u>	2	<u>261</u>
<	<u>Shop Support and Other Services.</u>	<u>239</u>	<u>242</u>	<u>62</u>	<u>65</u>
	Total, Technical Services	<u>955</u>	6	<u>466</u>	<u>565</u>

The funding provides for administrative data processing including equipment maintenance, programming and operation.

2	Operation _B	138	162	120	217
---	------------------------	-----	-----	-----	-----

B	Scientific and Technical Information.....	526	275	284	281
---	---	-----	-----	-----	-----

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		

1. Library	38	28	30	30
------------------	----	----	----	----

Library purchases are expected to remain constant through 1979.

2. Education and information... ..	488	247	234	231
------------------------------------	-----	-----	-----	-----

The 1979 level includes the Public Affairs costs, tours of the Visitor Information Center, film distribution, mail answering service, and pamphlets.

C. <u>Shop Support and Services</u>	<u>239</u>	<u>242</u>	<u>62</u>	<u>65</u>
---	------------	------------	-----------	-----------

The 1979 estimate will provide the same level of institutional fabrication, photographic services and graphics support as estimated in 1978.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u>	<u>1,862</u>	<u>1,829</u>	<u>1,780</u>	<u>2,070</u>
---	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. Administrative Communications.....	754	751	775	810
---------------------------------------	-----	-----	-----	-----

B. Printing and Reproduction.....	44	75	26	28
-----------------------------------	----	----	----	----

C. Transportation.. ..	532	467	413	578
------------------------	-----	-----	-----	-----

D. Installation Common Services... ..	<u>532</u>	<u>536</u>	<u>566</u>	<u>654</u>
---------------------------------------	------------	------------	------------	------------

Total, Management and Operations... ..	<u>1,862</u>	<u>1,829</u>	<u>1,780</u>	<u>2,070</u>
--	--------------	--------------	--------------	--------------

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u> (Thousands of Dollars)	1979 <u>Budget</u> <u>Estimate</u>
A. <u>Administrative Communications</u>	<u>754</u>	<u>751</u>	<u>775</u>	<u>810</u>

This estimate provides for leased lines and equipment for local and long distance telephone service, Federal Telecommunications Service (FTS), trunklines for Federal communications, and non-telephone communications including telex, advanced records system, "data fax" and teleconference equipment. The increases in 1978 and 1979 are related to rate increases in service offset by reduced cost related to personnel reductions at the Center.

1. Local telephone service.	362
----------------------------------	-----

This activity includes the leased lines and equipment necessary to serve the Center. This includes approximately 1,785 instruments, 800 stations and 40 incoming and outgoing lines.

2. Long distance telephone service.....	295
---	-----

Commercial long distance costs, FTS costs, and overseas calls are included in this category.

3. Non-telephone communications	153
---------------------------------------	-----

This estimate includes funds for one telex instrument, one GSA teletype, advanced record systems unit, one "rapid fax", one "data fax", four teleconference units, oceanic cable service, and postage.

B. <u>Printing and Reproduction</u>	<u>44</u>	<u>75</u>	<u>26</u>	<u>28</u>
---	-----------	-----------	-----------	-----------

This activity includes general printing services and printing of the Lewis News.

C. <u>Transportation</u>	<u>532</u>	<u>467</u>	<u>413</u>	<u>578</u>
--------------------------------	------------	------------	------------	------------

This function includes services for moving and hauling, packing and crating, motor vehicles special maintenance, procurement, aircraft operation and maintenance. Two support contractor workyears are utilized for heavy equipment maintenance at Plum Brook.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
D. <u>Installation Common Services.</u>	<u>532</u>	536	<u>566</u>	<u>654</u>

This funding provides for 32 workyears of support contractor effort to support Center management and staff activities, medical services, and various installation support services. FY 1978 and FY 1979 reflect the increasing costs of services in this area, primarily in support contractor cost increases.

1. Center management and staff.....	68
-------------------------------------	----

This funding provides for a support service contract for center management and administrative records keeping.

2. Medical services.....	40
--------------------------	----

This category includes the cost of medical supplies and routine medical examinations at local hospitals or doctors' offices.

3. Installation support services...	546
-------------------------------------	-----

This function includes the support service contracts for mail and package distribution services, and the stock issuance and warehousing operations. Also included are the purchase and maintenance of office machines and equipment.

National Aeronautics and Space Administration
Organization and Staffing Chart
LEWIS RESEARCH CENTER
Cleveland, Ohio

STAFFING SUMMARY		
	18	12
EXCEPTED	28	28
GS-15	3	3
GS-13	11	101
GS-14	77	269
OTHER GS	179	1574
WB	213	213
TOTAL PERMANENT	4930	2935

DIRECTOR'S OFFICE		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

OFFICE OF CHIEF OF STAFF		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

OFFICE OF RESEARCH & ANALYSIS		
	22	22
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

OFFICE OF TECHNICAL INVESTIGATION & PUBLIC AFFAIRS		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

OFFICE OF PLANNING, ANALYSIS, & OPPORTUNITY		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

DIRECTOR OF AERONAUTICS		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

MINI-TUNNEL AND FLIGHT DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

VISUAL AND WIND DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

PISTON SYSTEMS COMPONENTS DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

AERONAUTICS ENGINEERING DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

ENERGY CONSERVATIVE ENGINES OFFICE		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

DIRECTOR OF REACTOR SYSTEMS AND TECHNOLOGY		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

SPACE PROPULSION AND POWER DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

APPLICATION DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

MATERIALS & STRUCTURES DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

DIRECTOR OF ENERGY PROGRAMS		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

MANAGEMENT OPERATIONS OFFICE		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

SYSTEM ANALYSIS AND ADJUSTMENT OFFICE		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

TRANSLATIONS & PRODUCTION DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

ELECTRONIC RESEARCH DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

POWER GENERATION AND STORAGE DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

DIRECTOR OF ENGINEERING SERVICES		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

FLIGHT ARCHITECTURE		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

ENVIRONMENTAL ENGINEERING DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

POLYMER ENGINEERING DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

PERSONNEL DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

COMPUTER SERVICES DIVISION		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

LEWIS RESEARCH CENTER		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

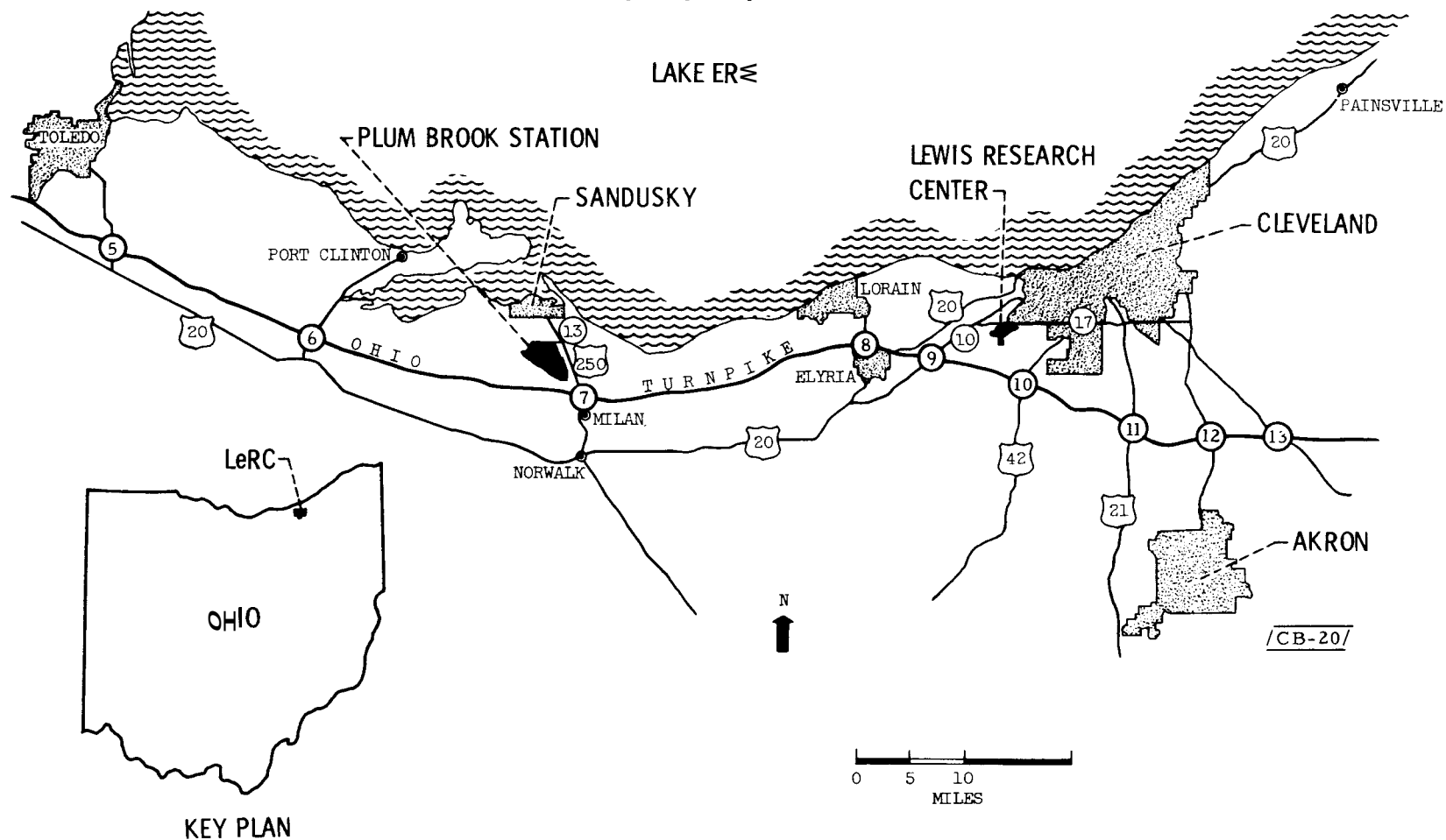
OFFICE OF RESEARCH & ANALYSIS		
	22	22
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

OFFICE OF TECHNICAL INVESTIGATION & PUBLIC AFFAIRS		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

OFFICE OF PLANNING, ANALYSIS, & OPPORTUNITY		
	18	12
EXCEPTED	1	1
GS-15	1	1
GS-14	1	1
OTHER GS	1	1
TOTAL	4	4

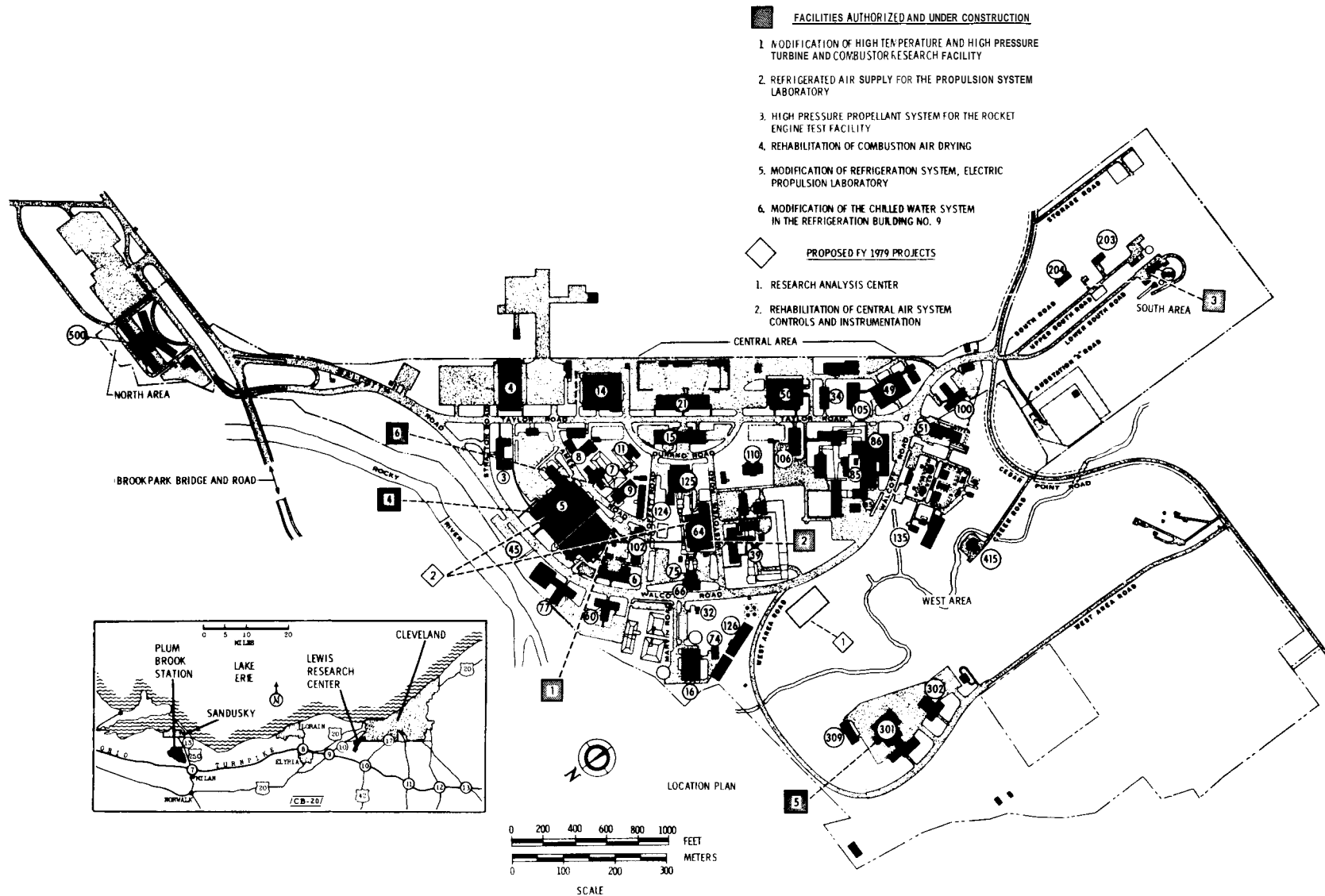
LEWIS RESEARCH CENTER
FISCAL YEAR 1979 ESTIMATES

PREP MAP



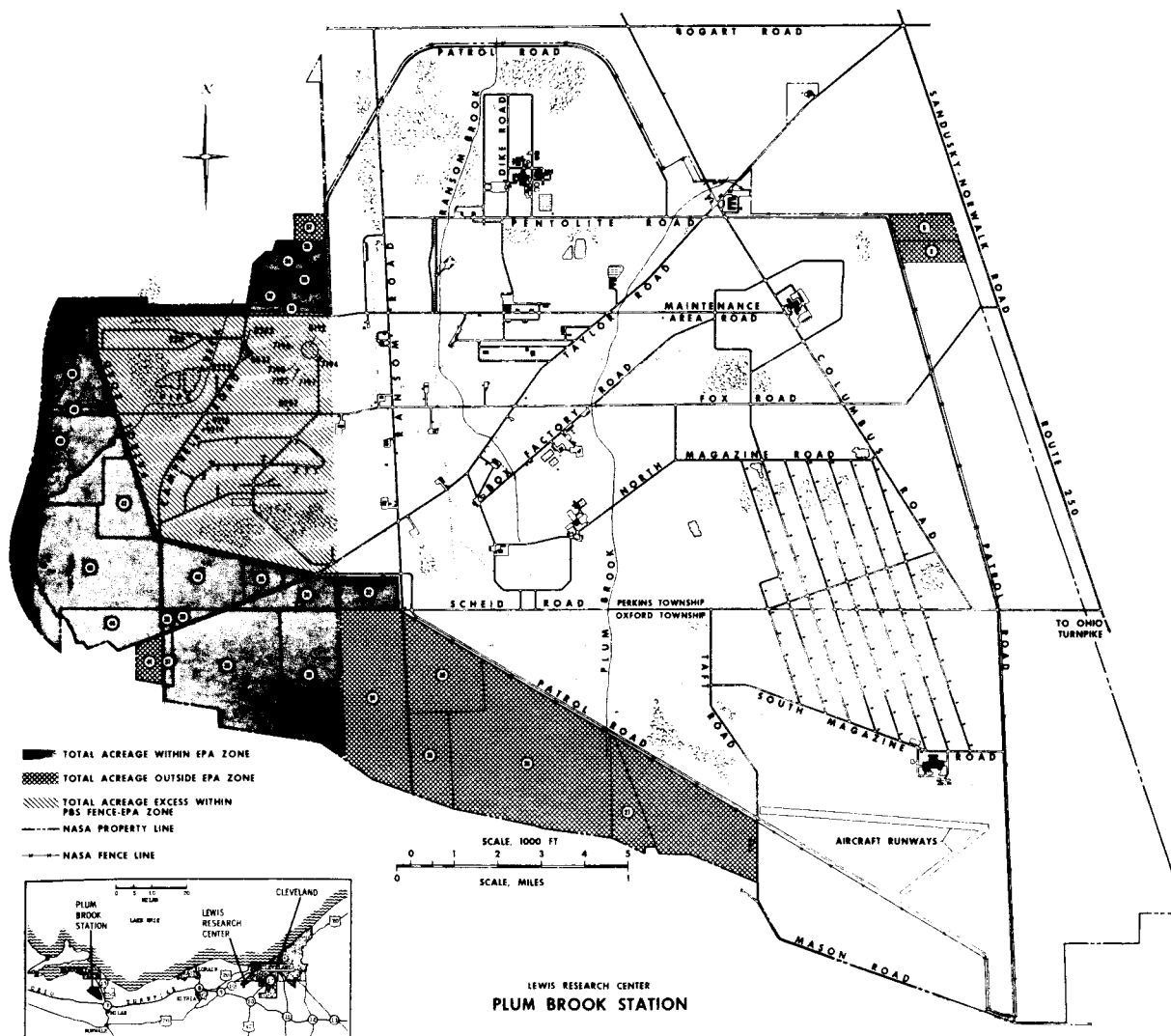
LEWIS RESEARCH CENTER FISCAL YEAR 1979 ESTIMATES

LOCATION PLAN



LEWIS RESEARCH CENTER
 PLUM BROOK STATION
 FISCAL YEAR 1979 ESTIMATES

LOCATION PLAN

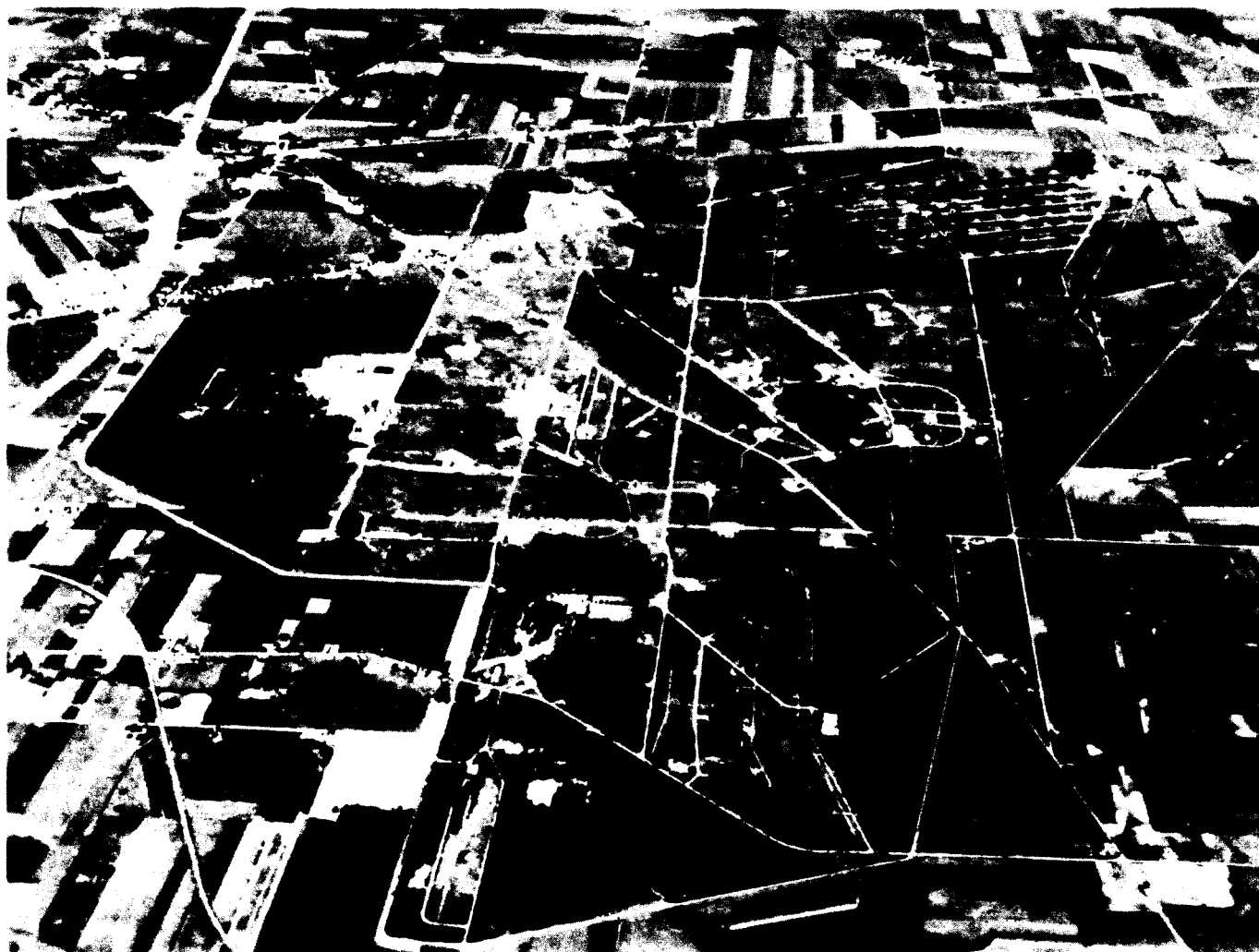


LEWIS RESEARCH CENTER
FISCAL YEAR 1979 ESTIMATES
CLEVELAND FACILITIES



RPM 10-24

LEWIS RESEARCH CENTER
FISCAL YEAR 1979 ESTIMATES
PLUM BROOK FACILITIES



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

NASA HEADQUARTERS

DESCRIPTION

NASA Headquarters is located at 400 Maryland Avenue S.W., Washington, D.C., and also occupies other buildings in the District of Columbia, Maryland and Virginia. Except for some office space leased in the District of Columbia and a storage area in Virginia, personnel occupy Government-owned buildings.

HEADQUARTERS ROLES AND MISSIONS

The mission of the National Aeronautics and Space Administration Headquarters is to plan and provide executive direction for the programs authorized by the Congress and to implement the national objectives stated in the National Aeronautics and Space Act of 1958, as amended. These objectives are to:

1. Extend our knowledge of the Earth, its environment, the solar system, and the universe;
2. Expand practical applications of space technology;
3. Develop, operate, and improve space vehicles;
4. Improve the civil and military usefulness of aeronautical vehicles, while minimizing their environmental effects and energy consumption.
5. Disseminate pertinent findings to potential users; and
6. Promote international cooperation in peaceful activities in space.

The following offices at Headquarters assist management in carrying out the technical aspects of the mission:

Office of Space Transportation Systems - Responsible for the research, development, and operations of space flight programs including the Space Shuttle, the essential element of the Space Transportation System that will be used to conduct the space operations of the 1980's. The Space Transportation System consists of the shuttle, a reusable vehicle; and the Spacelab, an experiments payload carrier being developed by the European Space Agency (ESA). The Space Transportation Systems Office also has program responsibility for expendable launch vehicles.

Office of Space Sciences - Responsible for scientific research and development effort utilizing a variety of flight systems and ground-based observations to increase man's knowledge of the universe. The Earth, Sun, Moon, the planets, interplanetary space, other stars and galaxies, and the interaction among these bodies and systems are all objects of these investigations. The Life Sciences program is also under the direction of the Office of Space Sciences.

Office of Space and Terrestrial Applications - Responsible for research and development activities leading to programs providing beneficial applications of space systems, and space related or derived technology. Programs involved include earth resources detection and monitoring, earth dynamics monitoring and forecasting, ocean condition monitoring and forecasting, environmental quality monitoring, weather and climate observation and forecasting, and communications.

Office of Aeronautics and Space Technology - Responsible for the aeronautical and space research and technology programs. The aeronautics program develops the technology needed to assure safer, more efficient, economical and environmentally acceptable air transportation systems which are responsive to national needs. The space research and technology program provides a technology base to support current and future space activities. This office is also responsible for coordinating the agency's total program of supporting research and technology related to carrying out specific flight missions to insure an integrated and balanced agency research program.

Office of Space Tracking and Data Systems - Responsible for the development, implementation, and operation of tracking, data acquisition, command, communications, data processing facilities, and systems and services required for support of all NASA flight missions. This office also provides centralized planning and systems management for the administrative communications of NASA installations.

Research and Program Management (R&PM) funding is used to support the staffing and operation of NASA-Headquarters in Washington, D.C. The overall capability of the agency to operate effectively is dependent upon sufficient R&PM resources to support a Headquarters workforce that provides direction and coordination to ensure accomplishment of the agency mission. This portion of the 1979 budget estimate is required to accomplish the following objectives:

To provide a balanced Headquarters workforce capable of planning and providing executive direction to the programs authorized by the Congress and implementing the national objectives stated in the National Aeronautics and Space Act of 1958, as amended.

To provide a balanced Headquarters supporting workforce capable of providing administrative, operational and logistical support to those Headquarters elements concerned with carrying out the mission of the National Aeronautics and Space Administration.

To provide adequate facilities to house the workforce in the Washington, DC area.

To provide for technical, administrative, and logistical support necessary to facilitate the management and operations of Headquarters.

The Headquarters workforce consists of a professional and clerical staff organized into the program offices indicated and appropriate supporting staff offices. Funding for pay, travel, and necessary support services are included in this portion of the budget submission. Each office is assigned a function consistent with carrying out the NASA Headquarters mission. The number of personnel authorized to an office is determined by Management based on the personnel ceiling for the Agency and the functions to be performed. The composition of the staff of an office is determined by the head of the office based on the office ceiling and the function to be performed. All personnel are appointed and paid consistent with classification standards established by the Civil Service Commission. Overall Agency direction is provided by the Administrator, and his staff. He is assisted by heads of special and technical staff offices which perform functions necessary to the effective operation of the Agency and the Headquarters. Such offices are concerned with administration and management or support of the Headquarters. Included are such offices as the Chief Scientist, Chief Engineer, Comptroller, General Counsel, External Relations, Management Operations, Aerospace Safety Advisory Panel, Equal Opportunity, Procurement, Inspections and Security, and Audit. The Headquarters currently has eleven (11) centers throughout the U.S. which perform agency operational missions under direction of the Headquarters staff.

The Headquarters supporting workforce is organized to perform agencywide and Headquarters roles, although some elements perform only Headquarters support functions. For example, the Office of Headquarters Administration provides for support to the personnel and physical plant in Washington while the Office of Personnel Programs provides both Headquarters and agencywide direction and support with respect to personnel requirements.

Facilities consist of GSA leased space at FOB-6, FOB-10B, and the Reporters Building in Washington, DC, a storage area in Virginia, and a facility in Maryland.

Technical support required by Headquarters is performed primarily by support service contractors. Currently, contractors support Headquarters automatic data processing, engineering services and the scientific and technical information program. Administrative and logistical support is provided by the inhouse workforce assisted by miscellaneous contract services. Such support include communications, printing, supplies, materials, equipment, transportation, occupational medicine and health, and miscellaneous administrative support services.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1977 <u>Actual</u>	<u>1978</u>		1979 Budget Estimate
		<u>Budget Estimate</u> (Thousands	<u>Current Estimate</u> of Dollars)	
I. Personnel and Related Costs.....	49,716	49,155	53,846	54,317
II. Trel	2,363	2,389	2,366	2,545
III. Facilities Services.....	4,146	5,248	5,035	5,610
IV. Technical Services.....	13,339	12,620	12,736	15,082
V. Management and Operations	<u>6,155</u>	<u>6,004</u>	<u>6,308</u>	<u>6,978</u>
Total, fund requirements	<u>75,719</u>	<u>75,416</u>	<u>80,291</u>	<u>84,532</u>

Distribution of Permanent Positions by Program

	1977 <u>Actual</u>	<u>1978</u>		1979 Budget Estimate
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
<u>Direct Positions</u>				
<u>Space Transportation Systems.. ..</u>	<u>190</u>	<u>191</u>	<u>203</u>	<u>203</u>
Space shuttle	80	77	80	75
Space flight operations	100	103	112	117
Expendable launch vehicles	10	11	11	11
<u>Space Sciences.....</u>	<u>104</u>	<u>109</u>	<u>104</u>	<u>104</u>
Physics and astronomy.....	39	39	39	39
Lunar and planetary exploration.	46	51	46	46
Life sciences.....	19	19	19	19

	1977 <u>Actual</u>	1978		1979 <u>Budget</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Estimate</u>
<u>Space and Terrestrial Applications</u>	108	116	111	111
Space applications	89	97	92	92
Technology utilization	19	19	19	19
<u>Aeronautics and Space Technology</u>	152	161	155	155
Aeronautical research and technology	75	81	77	77
Space research and technology	56	58	58	58
Energy technology applications	21	22	20	20
<u>Tracking and Data Acquisition</u>	44	42	42	42
Subtotal. direct positions	598	619	615	615
<u>Management and Operations Support Positions</u>	947	917	920	920
Total. permanent positions	1,545	1,536	1,535	1,535

PERSONNEL AND RELATED COSTS

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>49,716</u>	<u>49,155</u>	<u>53,846</u>	<u>54,317</u>
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	43,201	42,367	46,351	46,930
b. Nonpermanent	870	1,110	1,168	1,175
c. Reimbursable detailees.....	260	258	277	279
d. Overtime and other compensation.....	<u>264</u>	<u>258</u>	<u>293</u>	<u>277</u>
Subtotal, Compensation.....	44,595	43,993	48,089	48,661
2. <u>Benefits</u>	4,115	4,227	4,546	4,553
Subtotal, Compensation and Benefits.....	<u>48,710</u>	<u>48,220</u>	<u>52,635</u>	<u>53,214</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	136	206	206	220
2. Civil Service Commission Services.....	271	132	282	138
3. Personnel training.....	<u>599</u>	<u>597</u>	<u>723</u>	<u>745</u>
Subtotal, Supporting Costs.....	1,006	935	1,211	1,103
Total, Personnel and Related Costs.....	<u>49,716</u>	<u>49,155</u>	<u>53,846</u>	<u>54,317</u>

	1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u>	48,710	48,220	52,635	53,214
1. <u>Compensation</u>	44,595	43,993	48,089	48,661
a. Permanent positions	43,201	42,367	46,351	46,930

The cost for permanent positions is the largest part of personnel and related costs. The funds shown above will support 1,535 permanent positions in 1978 and in 1979.

Basis of Cost for Permanent Positions

The estimate for permanent compensation (starting from prior year cost) is based upon the position structure at the start of the year, as modified by the addition of new positions and abolishment of existing positions, within grade advances, career development, and the effect of 1978 pay increases. After these modifications, the year-end position structure is established and the cost effect for the year is calculated based on the estimated period that these modifications are in effect as follows:

Cost of permanent positions in 1978.....	46,351
Cost of increases in 1979.....	+901
Within grade advances and career development:	
Full year effect of 1978 actions.....	+412
Partial year effect of 1979 actions.....	+434
Full year effect of 1978 pay increases.....	+55
Cost decreases in 1979.....	-322
Turnover savings:	
Full year effect of 1978 actions.....	-50
Partial year effect of 1979 actions.....	-272
Cost of permanent positions in 1979.....	46,930

1977 <u>Actual</u>	1978		1979 <u>Budget Estimate</u>
	<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	

b. Nonpermanent positions

1. Cost.....	870	1,110	1,168	1,175
2. Number of workyears.....	100	91	106	105

The increase in the 1978 current estimate over the 1978 budget estimate is due to the effect of the 1978 pay increase, and an increase in the disadvantaged youth program. The 1979 program reflects temporary employment at the same level as in 1978.

The 1979 plan includes 105 nonpermanent workyears, which will be used to support the following programs at the levels indicated below.

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative program.....	12
Summer program.....	17
Youth opportunity program.....	40
Other temporary employment.....	<u>36</u>
Total.....	<u>105</u>

c. Reimbursable detailees.	260	258	277	279
---------------------------------	-----	-----	-----	-----

The services of a small group of military officers and civilian detailees from other government agencies are utilized by NASA Headquarters where such assignments are of mutual benefit. The number of personnel detailed varies from seven to 16, all of whom are assigned to Headquarters program and facilities offices. The estimates for 1978 and 1979 will cover the cost of nine workyears. The 1978 current estimate and the 1979 estimate are increased from the 1978 budget estimate to reflect an increase of two manyears, as well as the cost of 1978 pay increases.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
d. Overtime and other compensation.....	264	258	293	277

The estimate for overtime compensation for 1979 is less than for 1978. The increase in the 1978 current estimate over the budget estimate reflects increased activity associated with key program milestones and events within various management and operating offices, and the October 1977 pay raise. The decrease in 1979 represents a return to the level experienced in 1977 at current rates.

2. <u>Profits</u>	<u>4,115</u>	<u>4,227</u>	<u>4,546</u>	<u>4,553</u>
-------------------------	--------------	--------------	--------------	--------------

In addition to compensation, NASA makes an employer's contribution to personnel benefits as authorized and required by law. The increase in the 1978 current estimate and 1979 budget estimate from the 1978 budget estimate reflects the effect of 1978 pay increases. The following table indicates the costs of personnel benefits by the various cost categories:

Category of Cost

Civil Service Retirement Fund.....	3,029	2,968	3,256	3,291
Employee life insure	188	194	210	215
Employee health insurance.....	678	722	717	726
Workmen's compensation.....	94	125	125	129
FICA.....	44	95	68	69
Incentive awards.....	82	90	137	90
Severance pay.....	<u>---</u>	<u>33</u>	<u>33</u>	<u>33</u>
Total.....	<u>4,115</u>	<u>4,227</u>	<u>4,546</u>	<u>4,553</u>

B. <u>Supporting Costs</u>	<u>1,005</u>	<u>935</u>	<u>1,211</u>	<u>1,103</u>
----------------------------------	--------------	------------	--------------	--------------

Supporting personnel costs provide for the expenses of moving employees to their initial duty station or reassignment; for security investigations and other recruitment costs; and for maintaining and expanding the skills of our employees. These costs are summarized as follows:

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
1. Transfer of personnel	136	206	206	220

Legislation enacted in 1966 provided that the Government would pay for certain relocation costs which are budgeted in this category, such as the expenses of selling and buying a home, and the cost of family relocations. The estimated costs for 1979 are based on the historical number and average cost of relocations for Headquarter's personnel.

2. Civil Service Commission services.....	271	132	282	138
---	-----	-----	-----	-----

Headquarters reimburses the Civil Service Commission and others for investigation of new hires and Equal Employment Opportunity complaints for the entire agency. The cost of investigation is a function of two variables, the number of investigations to be conducted, and the unit charge made by the Civil Service Commission or other agency. There is also a payment to the Commission for Federal wage system surveys and any requested investigation of formal discrimination complaints. The increase in the 1978 current estimate over the 1978 budget estimate reflects an Aerospace Technical Validation Study to determine the effectiveness of personnel procurement systems in the aerospace field. The decrease in 1979 reflects the completion of the study.

3. Personnel training	599	597	723	745
-----------------------------	-----	-----	-----	-----

The maintenance and expansion of the skills are essential in carrying out the agency's many complex technical programs. Such training is provided within the framework of the Government Employees Training Act of 1958. Part of the training consists of courses offered by other Government agencies, usually for a fee. The remainder of the training is provided through nongovernmental sources. The costs are for tuition, fees and related costs for training at colleges, universities, technical institutions, and for the cost of seminars and workshops in which groups of Headquarters and Field Center employees receive training in subjects of agency-wide interest. Such training is used to maintain and expand employee skills. The increase between the 1978 budget estimate and the 1978 current estimate reflects increased training for mid-level management as well as increased activity in specialized training to meet functional requirements of the agency. The 1979 estimate reflects a continuation of the 1978 level for training at current rates.

TRAVEL

	<u>1977</u> <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
II. <u>TRAVEL</u>	<u>2,363</u>	<u>2,389</u>	<u>2,366</u>	<u>2,545</u>

Basis of Fund Requirements

A. Program Travel.....	916	1,075	973	1,095
B. Scientific and Technical Development....	248	277	259	235
C. Management and Operations Travel.....	<u>1,199</u>	<u>1,037</u>	<u>1,134</u>	<u>1,215</u>
Total, Travel.....	<u>2,363</u>	<u>2,389</u>	<u>2,366</u>	<u>2,545</u>

A. <u>Program Travel</u>	916	1,075	973	1,095
--------------------------------	-----	-------	-----	-------

Program travel is directly related to the accomplishment of NASA's research and development programs. This category represents approximately 43% of the Headquarters travel requirements for 1979. The program travel requires approximately 3,760 trips in 1979, an increase of about 260 trips over those anticipated in 1978. The increase in 1979 is required primarily to continue support of the Space Shuttle program.

B. <u>Scientific and Technical Development</u>	<u>248</u>	<u>277</u>	<u>259</u>	<u>235</u>
--	------------	------------	------------	------------

Scientific and technical development travel permits employees to participate in meetings and seminars with other representatives of the aerospace community. This participation allows personnel to benefit from exposure to technological advances in the field which arise outside NASA, as well as to present both accomplishments and problems to their associates. Many of these meetings are working panels convened to solve certain problems for the benefit of the Government. The decrease of the 1979 estimate from the 1978 estimate is due to the increased demand for Shuttle related program travel.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
C. <u>Management and Operations Travel</u>	<u>1,199</u>	<u>1,037</u>	<u>1,134</u>	<u>1,215</u>

Management and operations travel is for the direction and coordination of general management matters. It includes travel by senior officials to review Center requirements and operations, travel in such areas as personnel, financial management, and procurement to assure agency policies and procedures are being implemented properly throughout the agency, local transportation, and Congressional travel. This travel will involve about 2,265 trips, a slight increase of 45 trips over the 1978 estimate. The increase in the 1979 budget estimate over the 1978 current estimate is to cover increased effort in the institutional management area.

FACILITIES SERVICES

NASA Headquarters involves a complex of buildings in the District of Columbia and nearby Maryland and Virginia. These are either Government-owned or leased buildings for which NASA must provide reimbursement to GSA in accordance with P.L. 92-313.

This complex encompasses some 556,790 gross square feet of building space including 6 buildings. This complex of primarily office space supports an average daily Headquarters population of 2,000 to 2,100 personnel. The personnel are engaged in a one shift operation exercising management over the space flight centers, research centers, and other installations that constitute the National Aeronautics and Space Administration.

III. <u>FACILITIES SERVICES</u>	<u>4,146</u>	<u>5,248</u>	<u>5,035</u>	<u>5,610</u>
---------------------------------------	--------------	--------------	--------------	--------------

Basis of Fund Requirements

A. <u>Rental of Real Property</u>	<u>3,419</u>	<u>4,472</u>	<u>4,464</u>	<u>4,777</u>
---	--------------	--------------	--------------	--------------

B. <u>Maintenance and Related Services</u>				
--	--	--	--	--

1. <u>Utilities</u>	600	623	422	669
2. <u>Equipment</u>	6	3	7	10

Subtotal.....	<u>606</u>	<u>626</u>	<u>429</u>	<u>679</u>
---------------	------------	------------	------------	------------

C. <u>Custodial Services</u>	121	150	142	154
------------------------------------	-----	-----	-----	-----

Total, Facilities Services.....	<u>4,146</u>	<u>5,248</u>	<u>5,035</u>	<u>5,610</u>
---------------------------------	--------------	--------------	--------------	--------------

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
A. Rental of Real Property	<u>3,419</u>	<u>4,472</u>	<u>4,464</u>	<u>4,777</u>

This provides space for personnel as well as storage and warehouse space for equipment, supplies and materials. The area requirements are approximately the same as those rented in 1978; however the 1979 total cost increase reflects increased rental rates as projected by General Services Administration (GSA).

B. Maintenance and Related Services.....	<u>606</u>	<u>526</u>	<u>429</u>	<u>679</u>
1. Facilities.	<u>600</u>	<u>623</u>	<u>422</u>	<u>669</u>

This estimate includes funds for alterations such as partition changes, telephone changes, and general buildings maintenance. The 1979 estimate reflects the 1978 level as adjusted to provide funding for projects deferred from 1978.

2. Equipment	<u>6</u>	<u>3</u>	<u>7</u>	<u>10</u>
--------------------	----------	----------	----------	-----------

This includes reimbursement to GSA for installation and maintenance of security alarm systems and equipment.

C. <u>Custodial Services</u>	<u>121</u>	<u>150</u>	<u>142</u>	<u>154</u>
------------------------------------	------------	------------	------------	------------

This activity provides for security services. The increase in the 1979 estimate is for increased contract costs.

TECHNICAL SERVICES

	1977 Actual	1978 Budget Estimate Current Estimate (Thousands of Dollars)		1979 Budget Estimate
IV. <u>TECHNICAL SERVICES</u>	<u>13,339</u>	<u>12,620</u>	<u>12,736</u>	<u>15,082</u>

Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment.....	1,984	1,508	1,699	1,800
2. Operations.....	<u>2,217</u>	<u>2,915</u>	<u>3,415</u>	<u>3,962</u>
Subtotal.....	<u>4,201</u>	<u>4,423</u>	<u>5,114</u>	<u>5,762</u>

B. Scientific and Technical Information

1. Library.....	44	106	106	115
2. Educational and information.....	<u>8,941</u>	<u>7,916</u>	<u>7,341</u>	<u>9,017</u>
Subtotal.....	<u>8,985</u>	<u>8,022</u>	<u>7,447</u>	<u>9,132</u>

C. Shop Support and Services.....

	<u>153</u>	<u>175</u>	<u>175</u>	<u>188</u>
Total, Technical Services.....	<u>13,339</u>	<u>12,620</u>	<u>12,736</u>	<u>15,082</u>

A. <u>Automatic Data Processing</u>	<u>4,201</u>	<u>4,423</u>	<u>5,114</u>	<u>5,762</u>
---	--------------	--------------	--------------	--------------

This category includes funds for the lease, purchase, maintenance, and programming and operation services of ADP equipment. The increase in 1979 is due to increases for time sharing services and a wage escalation in the negotiated support service contract.

	1977	1978		1979
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
1. Equipment	1,984	1,508	1,699	1,800

The funding provides for the maintenance and lease of ADP equipment. The increase in FY 1979 is due to additional lease costs and a slight increase in maintenance costs.

2. Operations	2,217	2,915	3,415	3,962
---------------------	-------	-------	-------	-------

This funding provides for the programming and operation services for payroll, accounting, procurement, personnel, supply, and contract reports. The increase in 1978 between the budget and the current estimate is due to an increase of eleven support contractor workyears. The increase in 1979 is due to escalated requirements for time sharing services and the negotiated wage escalation in the support service contract.

B. <u>Scientific and Technical Information..</u>	<u>8,985</u>	<u>8,022</u>	<u>7,447</u>	<u>9,132</u>
--	--------------	--------------	--------------	--------------

This category includes funds for the operation of technical libraries, educational and information programs, operation of the NASA Scientific and Technical Information Facility, and documentation services, such as preparation of manuscripts and printing. Approximately 42% of the total estimate for FY 1979 represents the cost of the NASA Scientific and Technical Information Facility.

1. Libraries.....	44	106	106	115
-------------------	----	-----	-----	-----

The technical libraries provide reference acquisition, cataloging, translating and dissemination services to all NASA employees. No significant changes are planned in 1979.

2. Educational and Information... ..	8,941	7,916	7,341	9,017
--------------------------------------	-------	-------	-------	-------

Two major activities are contained in this subfunction. The first is the educational and informational program and the second is the NASA Headquarters scientific and technical information activity.

a. Educational and information programs.....	2,469
--	-------	-------

The educational and informational programs provide for the gathering and dissemination of information about the agency's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary levels. Assistance to the mass communications media

includes the gathering and exposition of newsworthy materials in support of their requests, and takes such forms as press kits, news releases, television and radio information tapes and clips, and feature material. Research, development, and operational missions in aeronautics and space provide substantive knowledge and serve as an educational stimulus to students and teachers. NASA responds to expressed needs of students and teachers by developing curriculum supplements in space-related areas such as physics, biology, chemistry, and math; assistance to over 1,000 teacher workshops and professional education meetings (with over 30,000 teachers participating); and participation in science fairs. The largest single program is the Spacemobile, a touring space-science education lecture demonstration unit. These funds also provide for Equal Employment Opportunity exhibits and films to relate to high schools, colleges, and the public, the key roles that women and minorities play in the U.S. Space Program. The increase in 1979 is due to the increased costs of providing educational and news services and the spacemobile program.

b. Scientific and technical information..... 6,548

The scientific and technical information activity includes the cost of the NASA Scientific and Technical Information Facility (STIF), documentation and publication services, systems development, and translation services. The largest requirement is the NASA Scientific and Technical Information Facility, which is estimated to cost \$3.8 million in 1979. The cost of all other information services is estimated at approximately \$2.7 million. These costs are for the documentation of worldwide aerospace journals and report literature; monographs and technical reviews; analyzing, evaluating, and testing new methods and systems in the field of scientific communications to increase the effectiveness of the technical information program; and translating foreign language technical books, reports, and journal articles required to meet the needs of NASA and its contractor scientific personnel to keep abreast of world developments in the space sciences and related fields. The 1979 estimate reflects support contractor wage escalation and a full twelve month's funding and increased costs in the documentation of published literature.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u>		1979 <u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
C. Shop Support and Services.	153	175	175	188

These funds provide for the continuation of studies on reliability cost evaluations and NASA-wide Safety, Reliability and Quality Assurance Standards. The \$13,000 increase in the 1979 estimate will provide for preparation of the Safety and Parts Applications Handbooks.

MANAGEMENT AND OPERATIONS

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
V. <u>MANAGEMENT AND OPERATIONS</u>	<u>6,155</u>	<u>6,004</u>	<u>6,308</u>	<u>6,978</u>
<u>Basis of Fund Requirements</u>				
A. Administrative Communications.....	1,658	1,857	2,163	2,284
B. Printing and Reproduction	760	527	662	722
C. Transportation.....	186	170	169	182
D. Installation Common Services.....	<u>3,551</u>	<u>3,450</u>	<u>3,314</u>	<u>3,790</u>
Total, Management and Operations	<u>6,155</u>	<u>6,004</u>	<u>6,308</u>	<u>6,978</u>
A. <u>Administrative Communications</u>	<u>1,658</u>	<u>1,857</u>	<u>2,163</u>	<u>2,284</u>

Provides for the costs of leased lines, long distance tolls, telephone exchange services, and other communications, such as telegraph and postage. The increase in 1979 is due to higher lease lines and postal costs.

1. Local telephone service..... 556

Includes cost of operation of telephone exchange services.

2. Long distance telephone service..... 902

Covers cost of leased lines and long distance tolls.

3. Non-telephone communications. 826

Includes postage and TWX services.

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	1978 <u>Current</u> <u>Estimate</u>	1979 <u>Budget</u> <u>Estimate</u>
B. <u>Printing and Reproduction</u>	<u>760</u>	<u>527</u>	<u>662</u>	<u>722</u>

Includes contractual printing and related composition and binding operations. This includes services performed by other agencies, chiefly the Government Printing Office (GPO), and commercial printing firms. All common processes of duplicating including photostating, blueprinting, microfilming, and other photographic reproductions, are included. The 1979 estimate reflects the full year effect of increased rates of printing costs.

C. <u>Transportation</u>	<u>186</u>	<u>170</u>	<u>169</u>	<u>182</u>
--------------------------------	------------	------------	------------	------------

Includes rental of trucks, as well as the movement of supplies, materials, equipment and related items. Also included is the cost of operating and maintaining the administrative aircraft which is assigned to the Jet Propulsion Laboratory but funded through NASA Headquarters.

D. <u>Installation Common Services</u>	<u>3,551</u>	<u>3,450</u>	<u>3,314</u>	<u>3,790</u>
--	--------------	--------------	--------------	--------------

This funding includes those services which support the Headquarters generally, such as: chart and related art work; operation of photocopy equipment; lease, maintenance and repair of office equipment and vehicles; subcontractor reporting systems; minor government and contractual services; contract histories; special project contracts; trucking and labor services; medical services; patent services; international support services; contractor incentive awards; Equal Employment Opportunity community relations and fellowships; Administrator's representation allowance; NASA management training programs; and overseas administrative support; and for supplies, materials, and equipment.

1. Installation support service.....	2,344
--------------------------------------	-------

This funding provides for chart and related art work, operation of photocopy equipment, maintenance and repair of office equipment and vehicles, subcontractor reporting systems, minor government and contractual services, contract histories, special project contracts and trucking and laboring services, patent services, international support services, contractor incentive awards, Equal Employment Opportunity community relations and fellowships, Administrator's representation allowance, NASA management training programs, and overseas administrative support. The increase in 1979 is due to previously negotiated service contractor wage increases and increased usage of labor service, the personnel management supervision contract, and mid-level manager training program career awareness program.

2. Medical services..... 329

This funding provides for the services and required supplies of the medical health unit. The increase in 1979 is due solely to negotiated support contractor wage increases as the level of effort remains unchanged.

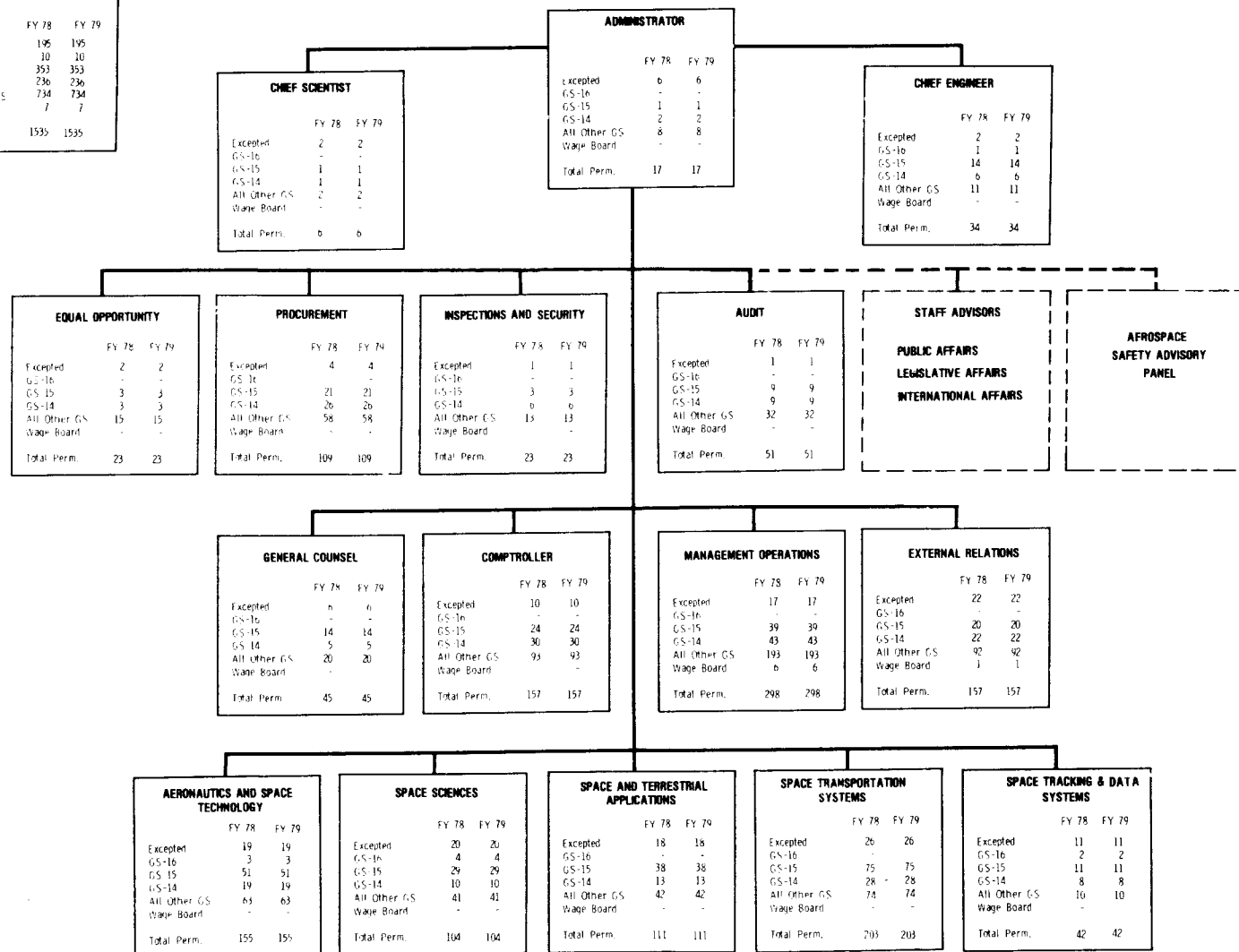
3. Supplies materials and equipment..... 1,117

This funding provides for the purchase of all office equipment and the supplies and materials required for the operation of NASA Headquarters. The small increase in 1979 reflects increased price schedules.

ORGANIZATION AND STAFFING

NASA HEADQUARTERS

STAFFING SUMMARY		
	FY 78	FY 79
Excepted	195	195
GS-16	10	10
GS-15	353	353
GS-14	236	236
All Other GS	734	734
Wage Board	7	7
Total Perm.	1535	1535



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 ESTIMATES

JET PROPULSION LABORATORY

DESCRIPTION

The Jet Propulsion Laboratory (JPL) is located in Pasadena, California, approximately 20 miles north of downtown Los Angeles. Subsidiary facilities are located at Goldstone, California (tracking and data acquisition), Edwards Air Force Base, California (propellant formulation and testing), and Table Mountain, California (open air testing and astronomy).

At Pasadena, the Laboratory occupies 176.8 acres of land of which 145.3 acres are owned by NASA and 30.9 acres are leased. At Goldstone, facilities are located on land occupied under permit from the Army. At Edwards Air Force Base, facilities are located on land occupied under permit from the Air Force. Facilities at Table Mountain are located on land occupied under permit from the Forest Service of the Department of Agriculture. The capital investment of the Jet Propulsion Laboratory including the Deep Space Network, fixed assets in progress, and contractor-held facilities, as of September 30, 1977, was \$378,314,000.

The Jet Propulsion Laboratory is a Government-owned facility, managed, staffed, and operated by the California Institute of Technology under a contract with NASA. The entire cost of operating the Laboratory is borne by the Research and Development appropriation, except for the lease or purchase of administrative aircraft and the purchase of passenger motor vehicles, which costs are funded from the Research and Program Management appropriation and are included in the NASA Headquarters budget presentation. Accordingly, the Research and Program Management type costs presented in this Special Analysis for JPL are for purposes of comparison only, and are not a part of the NASA Research and Program Management budget.

MISSION

The Jet Propulsion Laboratory has been assigned primary responsibility for the conduct of NASA programs concerned with scientific exploration of the moon, planets, and interplanetary space using automated spacecraft. The Laboratory is also assigned the conduct of selected automated earth-orbital missions. Implicit in these assignments is a broad range of engineering, scientific, and management functions devoted to:

1. The conduct of complete spaceflight projects, including overall project management and all phases of project activity beginning with mission design and scientific justification and following with spacecraft design, development, testing, and flight operations.

2. The development and operation of the Deep Space Network which provides tracking and data acquisition services for all NASA projects involving flights of automated spacecraft beyond near-earth orbits.
3. Continuing programs of scientific investigation and supporting research and technology.

In more specific terms, Laboratory activities in support of NASA can be categorized as follows:

Planetary Exploration - Since the very beginning of the nation's space activities the Jet Propulsion Laboratory has devoted a major part of its effort to the Lunar and Planetary Exploration Program. The Mariner series of spacecraft was designed and developed by JPL, and the Laboratory has had project management responsibility for all Mariner missions, including the functions of integration, assembly, and testing of the spacecraft. The two most recently completed missions in the Mariner series are those of Mariner 9, which returned scientific data for nearly a year from an orbit around Mars, and Mariner 10, which gathered data in a close flyby of Venus followed by three separate encounters with Mercury.

The Laboratory continues to be involved as a major participant in the Viking project which, during the summer of 1976, placed two spacecraft in orbit about the planet and two landers on its surface. Langley Research Center has had overall management responsibility for the Viking project and for development of the lander. JPL has had responsibility for the development of the orbiter, for the tracking and data acquisition system, and for the mission control and computing center. The mission plan involved placing the entire spacecraft in orbit about Mars, and, after suitable preparations, releasing the lander to enter the Martian atmosphere and soft land on the surface. Scientific data are collected in orbit, during atmospheric entry, and on the surface. In addition to delivery of the lander, the primary functions of the orbiter were to provide observational data for use in final selection of the landing site, and to serve throughout the mission as a relay station to receive, store, and to retransmit to earth data obtained from the lander. The orbiter carries its own scientific experiments including instrumentation to study surface temperature and atmospheric water vapor concentration, and television for surface photography. Viking mission operations are currently in an extended phase which is scheduled to continue until May 31, 1978. A plan to continue mission operations until January 31, 1979 is under consideration, assuming the spacecraft remain in good operating condition,

In the continuing series of planetary missions, the Jet Propulsion Laboratory has management responsibility for the Voyager Jupiter-Saturn 1977 missions (previously named Mariner Jupiter/Saturn 1977). Two spacecraft have been launched, on August 20 and September 5, 1977, and are currently operating well in cruise mode on planned trajectories. The launches occurred as intended during a time period when the relative positions of Jupiter and Saturn were uniquely favorable for the utilization of gravity-assist techniques which will permit the spacecraft in passing near Jupiter to be accelerated to reach Saturn in the relatively short time of 3 1/2 - 4 years following launch. Scientific data will be gathered on the interplanetary medium, the planets themselves, several of their large satellites, and the rings of Saturn. The mission design includes

an option to adjust the trajectory of one spacecraft as it nears Saturn and enable it to continue on to Uranus. The spacecraft for these missions makes maximum use of previous Mariner and Viking Orbiter designs and technology, consistent with the requirements of long-range communications, solar independent power, and the required flight times.

The Jet Propulsion Laboratory will have project management responsibility for the Jupiter Orbiter Probe (JOP) mission, which is a new project start in FY 1978. This mission is regarded in the scientific community and by NASA as the next logical step in planetary exploration. The spacecraft will consist of an orbiter and an atmospheric probe. The probe will be separated at a suitable time to enable it to penetrate the planet's atmosphere. It will be designed to make direct measurements of physical and chemical properties and to survive to a considerable depth. The orbiter will have a lifetime in orbit of some 20 months during which it will observe Jupiter and several of its major satellites at close range. JOP will be the first planetary mission to be launched aboard the Space Shuttle. The launch date is in the period December 1981 - January 1982.

Scientific Satellites - Consistent with its role as an alternate center for earth-orbital spacecraft development, the Laboratory has been selected to manage the Infrared Astronomy Satellite (IRAS) project. This project will involve international cooperation with the spacecraft bus being designed and built in the Netherlands. The NASA Ames Research Center will be responsible for the infrared telescope.

Space Applications - The Jet Propulsion Laboratory is assigned a principal role in the earth and ocean dynamics program and is responsible for management of the SEASAT-A project which is scheduled for launch in 1978. SEASAT-A is an experimental earth-orbiting satellite system designed to demonstrate techniques for global monitoring on a daily basis of sea-state conditions such as surface winds and temperature, currents, wave heights, ice conditions, and storm activity. Objectives include demonstration of social and economic benefits involving a variety of user communities, as well as improvement of scientific data for use by geodesists and tectonic physicists.

Supporting Research and Technology - The Jet Propulsion Laboratory maintains a strong program of supporting research and advanced technical development designed to provide sound technologies for present and prospective project assignments, and to further the general capabilities of NASA. Areas of involvement include spacecraft advanced development, autonomous systems, space power and electric propulsion, chemical propulsion, electronics, and basic research in such fields as fluid physics, polymer materials, and applied mathematics.

Science Program - The Laboratory participates in scientific experiments on both JPL-managed and non-JPL managed flight projects. This participation includes not only the performance of scientific investigations, but also a significant commitment to the development of scientific instruments for use in space missions. Ground-based research programs are carried out in the planetary sciences, physics and astronomy, and earth and ocean physics. These activities involve other NASA field installations.

Tracking and Data Acquisition - The Jet Propulsion Laboratory is responsible for the design, development, maintenance, and operation of NASA's worldwide Deep Space Network and a Mission Control and Computing Center. Tracking stations are located in California, Spain, and Australia. These facilities provide support not only to JPL-managed flight missions, but also to projects such as Pioneer and Helios managed by other NASA installations and involving flights beyond near-earth orbits.

Distribution of Permanent Positions by Program

	<u>1977 Actual</u>	<u>Budget Estimate</u> (Thousands of Dollars)	<u>1978 Current Estimate</u>	<u>1979 Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>10</u>	<u>12</u>	<u>10</u>	<u>6</u>
Space Shuttle,.....	7	---	8	4
Space flight operations.....	3	10	2	2
Expendable launch vehicles.....	---	2	---	---
<u>Space Science</u>	<u>1,073</u>	<u>758</u>	<u>846</u>	<u>972</u>
Physics and astronomy.....	75	73	73	76
Lunar and planetary exploration.....	975	660	753	874
Life sciences.....	23	25	20	22
<u>Space and Terrestrial Applications</u>	<u>200</u>	<u>156</u>	<u>215</u>	<u>153</u>
Space applications.....	194	150	210	148
Technology utilization...,	6	6	5	5
<u>Aeronautics and Space Technology</u>	<u>271</u>	<u>316</u>	<u>316</u>	<u>302</u>
Aeronautics research and technology.....	16	19	14	15
Space research and technology.....	224	253	267	257
Energy technology applications.....	31	44	35	30

	1977 <u>Actual</u>	1978 Budget <u>Estimate</u> (Thousands	1978 Current <u>Estimate</u> of Dollars)	1979 Budget <u>Estimate</u>
<u>Tracking and Data Acquisition</u>	<u>362</u>	<u>373</u>	<u>383</u>	413
Subtotal, direct positions	1,916	1,615	1,770	1,846
<u>Direct Support</u>	585	581	574	581
<u>Center Management and Operations Support</u>	<u>1,050</u>	<u>1,073</u>	<u>1,038</u>	<u>1,045</u>
Total, Positions.....	<u>3,551</u>	<u>3,269</u>	<u>3,382</u>	<u>3,472</u>

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

I. Personnel and Related Costs.....	91,762	94,571	94,768	101,148
11. Travel,.....	4,104	3,867	4,145	4,187
III. Facilities Services.....	7,357	8,937	8,401	9,371
IV. Technical Services,.....	3,476	3,364	3,683	3,849
V. Management and Operations	<u>11,461</u>	<u>9,884</u>	<u>10,989</u>	<u>10,960</u>
Total, fund requirement	<u>118,160</u>	<u>120,623</u>	<u>121,986</u>	<u>129,515</u>

SIMULATED RESEARCH AND PROGRAM MANAGEMENT BUDGET

EXPLANATION OF CHANGES

Personnel and Related Costs - The increase in the FY 1979 estimate is due to a higher manpower ceiling (+90 workyears) and to adjustments in retirement, health insurance, benefits to former personnel and minor adjustments in other benefits. No provision for salary rate adjustments has been included in the 1979 estimates.

Travel - The increase from the FY 1978 budget estimate to the current estimate, reflects late accruals of costs experienced near the close of FY 1977 and carried over into FY 1978, due to technical problems encountered on the Voyager II launch.

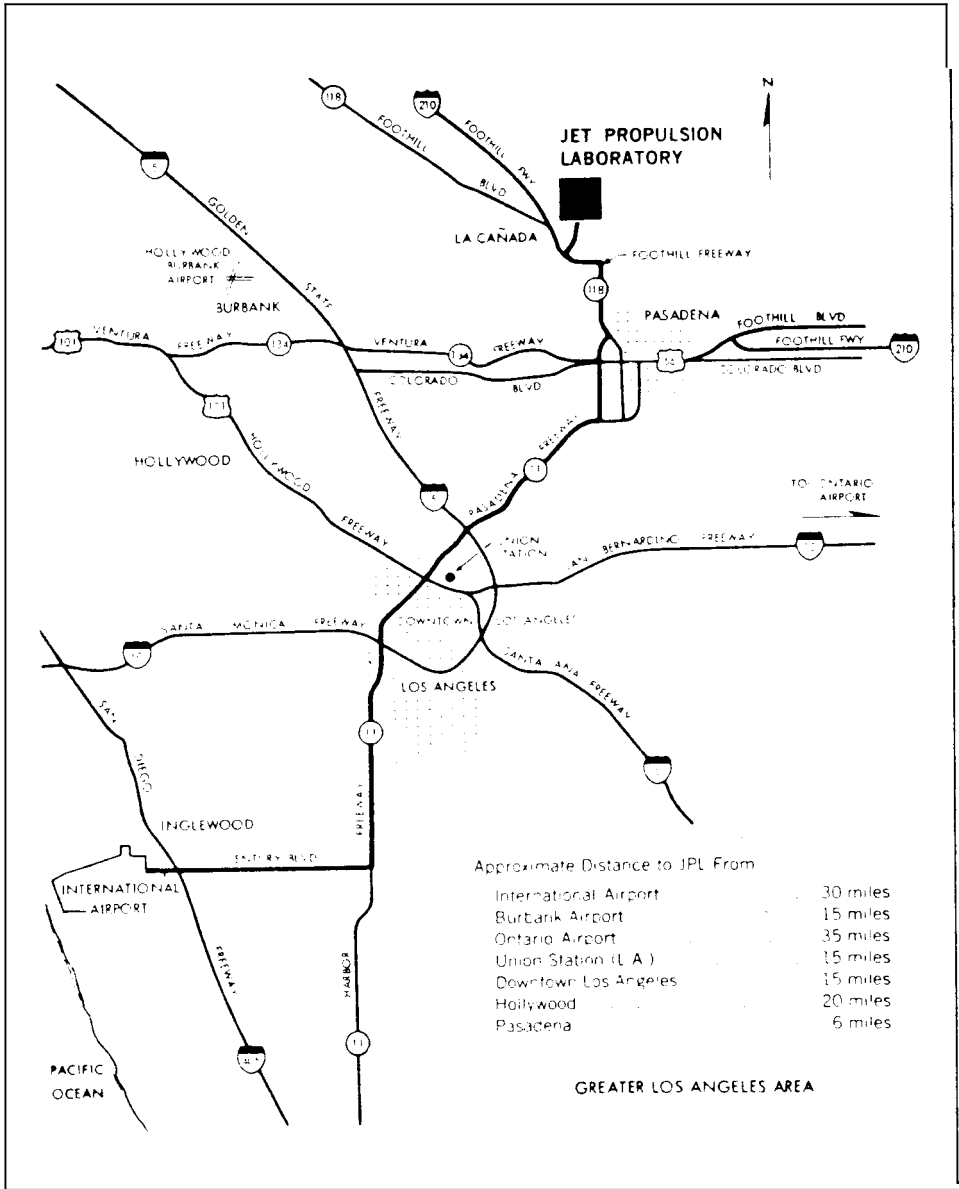
The estimate from FY 1978 to FY 1979 represents an increase of 1%.

Facilities Services - The decrease in the FY 1978 current estimate from the budget estimate is due to decreased consumption of supplies and equipment and lower than anticipated costs for maintenance of buildings and grounds. The increase from FY 1978 to FY 1979 is due to higher rates for utilities and upgrading of laboratory equipment. The reclassification of categories between Management and Operations and Facilities Services also contributed to the increase.

Technical Services - The increase from the budget estimate to the current estimate for FY 1978 reflects the reclassification of categories. The increase in FY 1979 is in support of the continuing need for engineering services to develop plans and specifications for facility modification.

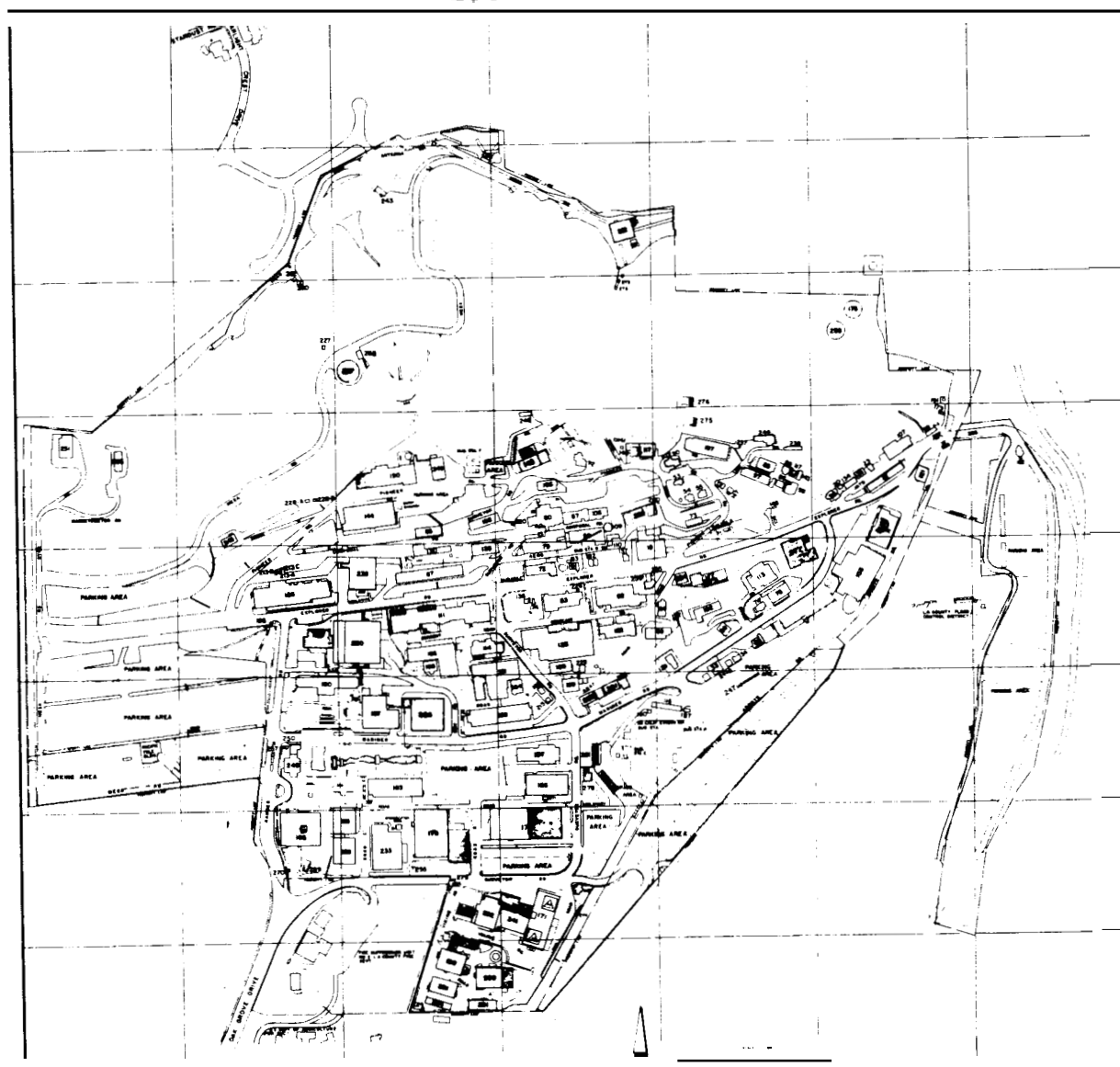
Management and Operations - Rate increases and an increase in communication activity and normal inflation in printing and documentation, transportation and other administrative services, offset by reclassification of categories between Management and Operations Facilities Services, account for the slight decrease in the estimate for FY 1979.

JET PROPULSION LABORATORY



JET PROPULSION LABORATORY

LOCATION PLAN



JET PROPULSION LABORATORY LEGEND

Bldg. No.	Title	Location	Bldg. No.	Title	Location	Bldg. No.	Title	Location	Bldg. No.	Title	Location
11	Space Sciences Lab	E-2	103	Fabrication Shop	E-3	177	Transportation Garage	D-2	249	Visitor Reception Bldg	C-1
13	Officer. Lab & Shop	D-3	106	Test Cell (Air Fuel)	C-2	179	Spacecraft Assy Facility	8-3	250	Guard Shelter	A-1
18	Structural Test Lob	D-2	107	Test Cell	E-2	180	Central Engineering Bldg	B-3	251	Gyro Lab	A-2
20	Shop Test Cell No. 2 (Liq)	D-2	109	Cooling Tower (Wind Tunnel)	C-2	182	Bus Stop Shelter	E-2	253	Low-Mag Interference Lob.	A-2
23	Shop Test Cell No. 12 (Liq)	E-2	110	Fuel Stor Tonk	C-2	183	Physical Science Lob	B-3	255	Sewage Lift Station	B-1
31	Test Cell (Liq)	E-2	111	General Offices Bldg	B-2	184	Electronic Stores	C-3	256	Model Range Control Bldg	B-1
32	Test Cell (Liq)	D-2	114	Cafeteria & Offices	C-3	185	Programming Office	B-3	257	Guord Island	B-3
33	Test Cell (Liq)	D-3	115	Heating Plant (Solid)	D-2	186	Space Sciences Div Bldg	A-3	258	Water Reservoir	C-1
34	Shop Test Cell No. 33 (Liq)	D-3	116	Propellant Storage Dock	D-3	187	Chemical Storage	D-3	259	Liquid Nitrogen Bottling Stor.	D-2
35	Mag Flux Tank Shelter	B-1	117	Test Cell (Solid)	D-2	188	Engineering Facilities Bldg	C-2	260	Illuminator Equipment Bldg	B-1
41	Hi-Tamp Lob	D-3	118	Cooling Tower	C-3	189	Electronics Lab-Annex	C-3	261	Material Storage	C-3
42	Test Cell (Liq)	D-3	120	Cooling Tower	D-2	190	190A Procurement Officer	B-4	262	Radiometer Bldg	B-1
46	Shop Test Cell No. 42 (Liq)	D-3	121	Employment Development Ctr	E-2	191	Hazardous Test Bay	E-2	263	Protective Services Bldg	C-3
47	Plant Protection	D-2	122	Engineering Offices	C-3	192	Propulsion Engineering	D-3	264	SFOF Sys Dev Lob	B-3
53	Conditioning Lab (Solid)	D-3	125	Combined Electronics	C-3	195	Guard Shelter	B-3	267	Water Reservoir	B-2
54	Blending Lab (Solid)	D-2	126	Systems Div Office Bldg	B-2	196	Guard Shelter	B-2	268	Pump House	B-1
55	Mixing Lab (blid)	D-2	129	Test Cell (Chemistry)	D-3	197	Solid-Propellant Process Lab	D-2	269	Grounds Maintenance Bldg	C-4
57	Test Cell (Air Fuel)	C-2	130	Engineering Offices	C-2	198	Guidance Lob	C-3	270	Sewage Metering Station	A-J
58	Compressor Bldg	C-2	133	Service Dock	C-2	199	Celestial Simulator Bldg	C-3	271	Oil Barrel Stor	C-3
59	Chemistry Lob	D-3	134	Shop Test Cell	E-2	200	Plant Engineering Services	B-4	272	East Illuminator Bldg	C-1
65	Materials Lab	D-3	135	Guard Shelter	A-2	201	Carpenter Shop	B-4	273	East Illuminator Tower	C-1
67	Microbiology Facility	B-2	136	Cooling Tower	C-2	202	Procurement Offices	B-4	274	Cooling Tower	C-3
71	Mechanics Stores	D-2	137	Cooling Tower	C-2	209	Illuminator Tower	D-1	275	Chemical Stor Prop Bldg	D-2
72	Engineering Offices	C-2	138	Engineering Offices	C-2	210	Blaine Track	D-1	276	Chemical Stor Prop Bldg	D-2
73	Utilities Arm Storage	D-2	140	Magazine X Temp	C-2	212	Antenna Lob	D-1	277	Isotope Thermoelectric Lob	D-2
74	Test Cell (Chemistry)	D-3	141	Magazine X Temp	C-2	213	Cooling Tower 'A', 'B' & 'C'	B-2	278	Helicopter Moint Hangar	C-3
77	Soil Science Lab	C-2	145	Magazine Propellant	D-2	218	Credit Union	B-3	279	Guord Island	B-3
78	Hydraulics Lab	D-3	147	Cooling Tower	D-2	220	C.R.S. Terminal Bldg	C-2	280	Static Test Tower	D-2
79	Wind Tunnel (20 inch)	C-2	148	Energy Conversion Lob	C-2	224	Sewer Lift Station	B-4	281	Fireman / Guord Station	C-3
80	Wind Tunnel (21 inch)	C-2	150	25-ft Space Simulator	B-2	225	Guord Shelter-Mesa	C-1	283	Metal Storage Building	C-3
81	Battery Laboratory	E-2	152	Hazardous Chemical Stor	C-3	226	Solvent Storage Bldg	C-2	284	Transportation Office Bldg	D-2
82	Environmental Test Lab	C-2	156	Computer Program Office	B-3	227	Guord Shelter	B-1	285	Arroyo Bridge	E-2
83	Electronic Parts & Engineering	C-2	157	Engineering & Mechanics Bldg	C-3	228	Cooling Tower (A & B)	B-2	286	Guord Bldg, Arroyo	E-2
84	Test Cell & Solid Chemistry	D-2	158	Material Research Proc Lab	C-3	229	Shielded Room Bldg	C-3	287	Island Guard Bldg	E-2
85	Business Systems Office	C-2	159	Pump House (Water)	E-2	230	Space Flight Operations Facility	B-2	288	Project Equipment Storage	C-2
86	Oxidizer Grinding (Solid)	D-2	160	Sewage Lift Station	C-3	231	Paint Shop	B-4		'A' Gate	A-3
87	Ovens (Solid)	D-2	161	Telecommunications Lab	C-3	233	Spacecraft Development Bldg	B-3		'B' Gate	A-3
88	Mixing Lab (Solid)	D-2	165	Cooling Tower	C-3	234	Lumber Stor Bldg	B-4		'C' Gate	B-2
89	Processing Lab (Solid)	D-2	166	Cooling Tower	C-2	237	Cooling Tower	D-2		'D' Gate	
90	Shop Test Cell No. 51	D-2	167	Cafeteria	B-3	238	Telecommunications Lob	B-2		'E' Gate	B-5
91	Air Dryer (Wind Tunnel)	C-2	168	Space Sciences Instrmt Sys Lab	B-3	239	Low-Temp Solid Prop Mag	D-2		'F' Gate	B-2
92	Cooling Tower (Wind Tunnel)	C-2	169	Engineering Office Bldg	B-3	241	Shipping & Receiving	B-4		'G' Gate	A-2
93	Vaporizer (Wind Tunnel)	C-2	170	Fabrication Shop	C-3	243	Remote Antenna Range Contr	B-1			
97	Development Lab & Offices	D-2	171	Materials Service Bldg	C-4	244	Hi-Temp Stor Mag	D-2			
98	Preparation Shop (Solid)	D-2	173	Test Shelter	E-2	245	Spectroscopy Lab	B-2			
99	Chamistry Lab (Solid)	D-3	174	Cooling Tower	C-2	246	Soils Test Lab	C-2			
			175	Water Reservoir	E-2	248	10-ft Space Simulator	C-2			



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1979 ESTIMATES

SUMMARY OF AERONAUTICAL RESEARCH AND TECHNOLOGY
OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

	1977 <u>Actual</u>	1978 <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Millions of Dollars)		1979 <u>Budget</u> <u>Estimate</u>
Research and development.....	190.1	231.0	228.0	264.1
Construction of facilities..... ..	35.0	38.4	38.4	76.5
Research and program management.....	<u>152.5</u>	<u>154.0</u>	<u>174.7</u>	<u>181.2</u>
 Total.....	 <u>377.6</u>	 <u>423.4</u>	 <u>441.1</u>	 <u>521.8</u>
 Number of direct positions (end of year) associated with aeronautical research and technology.....	 <u>3,708</u>	 <u>3,795</u>	 <u>3,933</u>	 <u>3,925</u>

The objectives of the Aeronautical Research and Technology program are to provide the Nation with the necessary technology for safer, more economical, more efficient, and environmentally acceptable air transportation to support the Department of Defense in maintaining the superiority of U.S. military aircraft; and to maintain a strong U.S. competitive position in the international aviation marketplace.

The FY 1979 program supports these objectives by stressing the technology areas judged to be the most critical by special in-house and out-of-house assessments, industry, advisory groups, and other users of technology within and outside the Federal Government. The FY 1979 activities are designed to maintain a strong research and technology base position in the various technology disciplines. The strength of this generic research and technology base is essential to enhance the growth of new improved aeronautical products. Emphasis will be placed on improving aircraft energy efficiency and performance; reducing noise and pollution; improving safety and terminal area operations; and advancing long-haul and short-haul air transportation concepts.

In the area of conventional takeoff and landing aircraft, efforts will be continued to reduce aircraft noise and emissions, to improve terminal area safety and aircraft operations, and to evaluate the suitability of broad specification jet fuels for use in current and future commercial jet engines. Continued progress will be achieved in the aircraft energy efficiency technology efforts, including an additional phase of laminar flow control technology.

Rotocraft activities will continue to address rotor aerodynamics, structures, avionics, flight dynamics, terminal operations, engines and drive systems and rotor system design. General aviation activities will emphasize the reduction of noise and emissions, crashworthiness and advanced low-cost avionics systems. In vertical takeoff and landing technology, broad based technology for future Navy and civil aircraft applications will be continued. Supersonic cruise research will continue the development of a focused technology base in the areas of propulsion, aerodynamics, structures and controls. Also, efforts will be continued in support of the military in the area of high performance aircraft.

The construction of facilities request for FY 1979 includes the third years' funding elements for the construction of the National Transonic Facility at the Langley Research Center and for the modification of the 40 X 80-Foot Subsonic Wind Tunnel at the Ames Research Center. It also provides at the Ames Research Center for modification of the Unitary Plan Wind Tunnel, modification of the 3.5-Foot Wind Tunnel, and modification of the 12-Foot Pressure Wind Tunnel. The request further provides for rehabilitation of the Unitary Plan Wind Tunnel at the Langley Research Center, and finally for construction of the Research Analysis Center at the Lewis Research Center.

The research and program management funding provides for the civil service salaries, travel, electric power for wind tunnel operations, and other general installation costs necessary to support the aeronautics program.

RESEARCH AND DEVELOPMENT
ESTIMATED FY 1979 OBLIGATIONS FOR
EQUIPMENT TO BE PLACED AT NASA INSTALLATIONS

(Thousands of Dollars)
1979

Program Budget Line Item

<u>Space Transportation Systems</u>	64,362
Space Shuttle	(37,518)
Space Flight Operations	(26,844)
<u>Space Science</u>	5,461
Physics and Astronomy.....	(1,964)
Life Sciences.....	(3,497)
<u>Space and Terrestrial Applications</u>	3,584
<u>Aeronautics and Space Technology</u>	23,542
Aeronautical Research and Technology	(21,673)
Space Research and Technology.....	(1,869)
<u>Tracking and Data Acquisition</u>	41,300
GRAND TOTAL.....	<u>138,249</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Shuttle	Johnson Space Center Bldg. 35, 72-76-01	Shuttle Procedures Simulator	Provides shuttle crew station procedures simulator	100	
Space Shuttle	Johnson Space Center Bldg. 5, 72-76-03	Shuttle Mission Simulator	Provides both a motion base and fixed simulator with out-the-window display	1,900	FY 1976 Modifications to Crew Training Facilities Bldg. 5 CofP Project 7278
Space Shuttle	Johnson Space Center Bldg. 30, 72-77-01	Computers for Shuttle Data Processing Complex	Replacement of computer8 in real time computer complex		FY 1977 Modifications to the Mission Con- trol Center Bldg. 30
Space Shuttle	Johnson Space Center Bldg. 30, 72-78-03	Orbiter Data Reduction Complex	Computers to support post flight orbiter data reduction	1,282	FY 1978 Modifications to administrative Bldg. 30
Space Shuttle	Johnson Space Center Bldg. 44, 72-79-01	Electronics Systems Test (TDRS Electronics)	TDRSS S-band and Ku-band Orbiter link transceivers, S/Ku-band translators, and Ku-band downlink transceivers with appropriate RF multiplexers, de-multiplexers, and associated hardware	800	
Space Shuttle	Marshall Space Flight Center Slidell Computer Complex 62-79-01	High Capacity Storage	Mass storage memory system that provides on-line capability. This is a lease purchase arrangement total purchase price is \$1,400K	530	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 30, 72-77-04	Network Interface Processor (NIP)	Provides interface between mission control center and space tracking data network	1,225	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-01	Wide Band Recorder	Records incoming data at Mission Control Center	1,164	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-02	Display Control System	Provides data and control interface between the dis- play control system and the Shuttle data processing complex	2,620	
Space Flight Operations	Johnson Space Center Bldg. 5, 72-70-07	Space Lab Simulator (SLS)	Simulator to train flight and ground crews for the operation and monitoring of space lab subsystems	2,500	FY 1978 Modifications to accommodate Space Lab Support Simulator Bldg. 5
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-08	Dump Data Facility	Handles and processes all data recorded on-board shuttle vehicles	640	
Space Flight Operations	Johnson Space Center Bldg. 16, 72-79-02	Engineering Simulations (Computer Systems)	To provide engineering simulators for use in the design, development and evaluation of guidance, displays, and control systems for all phases of space flight.	1,425	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 16. 72-79-03	Engineering Simulations (Scene Generator)	To provide engineering simulators for use in the design, development, and evaluation of guidance, displays, and control systems for all phases of space flight. This scene generating system will provide out-the-window scenes for use in engin- eering simulation. It con- sists of special purpose digital computing equipment and display devices.	1,640	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-04	Flight Planning System II	Purchase of computer and peripherals for design and documentation of missions for the STS to a rate of 20 flights/year.	53	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-05	Flight Planning System III	Purchase of computers and peripherals for design and documentation of missions with the intent of increasing the design capability to 60 flights/year.	3,075	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-06	Hardcopy Unit	To provide hardcopy of Digital Data display from the SDPC	200	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-07	Payload Operating Control Center (POCC) Computer	To provide the capability to process command and control parameters from several independent Payload data streams simultaneously	1,056	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-00	POCC Communications Interface	To provide capability to bring Independent Payload High rate data streams into JSC POCC	700	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-09	Payload Data Interleaver System	Downlink System to accept and process Digital Data from Shuttle PDI.	400	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-10	Text and Graphics System	System to provide for uplink of Text and Graphics infor- mation to the Shuttle	480	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION. BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 5, 72-79-11	Interim Upper Stage Simulator (IUSS)	The IUSS will be a set of equipment which will provide the added capability to the Shuttle Mission Simulator to train the flight crews to monitor and control the Interim Upper Stage vehicle and its subsystems. It will essentially provide a visual scene of the IUS in the windows of the SMS and allow the simulation of vehicle dynamics within the SMS computer complex	100	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Physics and Astronomy	Marshall Space Flight Center, Bldg 4708, 62-79-02	Spacelab Payloads Level IV Integration Capability Development System	The equipment in this system will provide for the physical integration and checkout of instruments into the Spacelab. This integration will include interface verification. compatibility tests and development of ground checkout applications software	1,339	
Space Applications	Goddard Space Flight Center, Bldg. 22 51-79-01	Greenbelt Modelling Activity Advanced Computer System	Major ADP System to supplant and extend capability of existing Amdahl 470 V6; system configuration under study, not yet specified. Principal applications: atmospheric sounding retrieval, data set assembly, atmospheric modelling. numerical forecast development in support of Global Atmospheric Research Program (CARP) and NASA Climate Research Program	980	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Aeronautical Research and Technology	Ames Research Center Bldg. N227A, 21 79-01	Oscillating Tip and Vortex Interaction System	The system will consist of three primary elements. The first element will consist of a device capable of being mounted on the sidewall of a large transonic wind tunnel and oscillating, in pitch, a three-dimensional tip section at frequencies up to 50 Hz and amplitudes of +10°. The second element will be a three-dimensional tip section typical of rotary wings, that is instrumented to provide detailed pressure distributions. The third element will be another sidewall mounted semispan model, mounted in tandem aft of the first section. This model, again will be typical of rotor tip configurations. but will be fixed. The first two elements will produce an oscillating tip section which will be both studied independently and used to generate a vortex which interacts with the following tandem model.	390	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN **FY 1979** BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION. BUILDING LOCATION. AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Aeronautical Research and Technology	Ames Research Center Bldg. N-233, 21-79-02	General Purpose Computer System	Provides expansion capability of 7 to 8 times the LMS 360/67, compatible with our present peripheral equipment. and inter- active operating system. The function suggested will be interaction, on- line computing for wind tunnels, graphics, space shuttle, and general purpose computing at the Center.	1.000	FY 1979 Conf Addition to Bldg. N-233
Aeronautical Research and Technology	Ames Research Center Bldg. N-227, 21-79-03	Propulsion Simulator Calibration Equipment	The propulsion simulator calibration equipment provides the proper pressure environment and the necessary instrumentation to accurately calibrate the thrust and airflow characteristics of advanced turbine powered propulsion simulators. The simulators are to be used in wind tunnel models to provide simultaneous simulation of the inlet and exhaust flows associated with the propulsion system.	390	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Aeronautical Research and Technology	Lewis Research Center 22-79-01	Scientific Computer	To provide increased computational speed, increased memory capacity, improved system reliability, and increased terminal support both for test facilities and interactive terminals	4,200	Funding also supported by Space Research and Technology and other Programs. Coff Project 2271
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14 51-79-02	XDS 930 Computer Replacement computer systems for obsoles- cent XDS 930 computers	Required to process real-time telemetry, drive displays, and format command messages for the many and varied spacecraft supported by MSOCC #1	400	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14 51-79-03	Telemetry and Command Processor (TAC). TAC will capture the data, line decode/encode, establish frame sync and format data compatible with existing Payload Opera- ting Control Centers (POCC)	Required to match the existing POCC's with command transmissions and non frame-synchron- ized telemetry data. This approach of inserting a TAC front- end to existing POCC's minimizes the impact to on-going mission support	800	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14 51-79-04	POCC Pilot Model (POCCNET). This acquisition is the start of the design and procurement of several mini/medl computers and per- ipherals to be used as a nucleus for the new POCCNET pilot model POCC. The pilot model will demonstrate the concept of distributed processing virtual peripherals. common software shared resources and computer networking.	Required to support the mission control workload in the 1980's and beyond in order to meet quick turnaround, increased support efficiency requirements and to minimize develop- ment and recurring costs with each new mission. The POCCNET concept is envisioned as very cost effective in the TDRSS/ STS/Spacelab/MMS era.	1,100	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14 51-79-05	Missions Operations Computing Facility (MOCF). Required to replace obsolete metric data collection and retrieval system and provide more real time orbit determination support capability as well as greater reliability for inter- computer data transfer	Provides mission operations control support to all GSFC POCC's	2,000	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. TBD 51-79-06	Space Telescope Operations Control Center Data System	Required to conduct the real time operation of the Space Telescope observatory with planned mission life of 15 years. The data system will require new space area of 5,000 square feet.	700	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 23 51-79-07	IPF Product Control and Generation. Pro- vides for the product control, accountability, and management of production data based on work, order requests	Required as an integral part of the planned general purpose digital image processing system facility	500	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 23 51-79-08	Wideband Communications Interface. Computing system to perform preprocessing function on incoming data	Required to match incoming data characteristics with present capability of the information processing installation	700	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Jet Propulsion Laboratory Bldg. 202, 55-79-01	Networks Operations Control System. Very Long Baseline Inter- ferometry Data Navigation Processor. Includes two interconnected computers with specialized peripheral and interface equipment to permit spacecraft course to be accurately and quickly determined by comparing its position against pre- determined locations of radio stars	Required for support of outer planet navigation missions such as JOP. Multiple time critical orbital trajectory changes during the 11 Jupiter satellite flybys with limited spacecraft propellant supply increases the need for radio navigation precision.	423	
Tracking and Data Acquisition	Wallops Flight Center 53-79-01	Mobile "C" Band Radar. Small computerized Mobile "C" Band Radar System to be incorporated into the WFC Mobile Facility supporting sounding rocket and balloon programs from remote locations	The existing MPS-19 radars in the Mobile Facility are surplus World War II equipment that will not meet current programmatic requirements as to range, accuracy, reliability, etc. Spare parts are difficult to obtain and are usually acquired by cannibalizing other surplus radars. This is the second of a four-unit replacement program to be accomplished in the 1978-1982 time frame	800	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1979 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1979 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Goddard Space Flight Center, 51-79-09	TDRSS Earth Station. Provides for monitoring the quality of data being passed through the TDRS multiplexer/ switching system and provides for switch- ing the 100 channel system from a central location	The multi-channel data from the TDRS station is switched, multiplexed, and distributed to JSC and GSFC. The performance of this system must be closely monitored. Individual terminal switching for mixing and matching will be difficult and single site control for error-free performance is required	915	